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TROPICAL DISEASES BULLETIN

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

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SUMMARY OF RECENT ABSTRACTS *

I. CHOLERA †

Epidemiology

SWAROOP (p. 407) has made a study of the world distribution of endemic cholera. It is not endemic in Egypt, the Philippine Islands and Japan though outbreaks have occurred there; the most important centres are in India and Pakistan, where 7 contiguous groups of districts form the major endemic foci. These are all located round rivers, have high density of population and are low-lying. Similarly in Burma the main focus is in the low-lying area of the Irrawaddy delta and in China in the Sikiang delta. In seaports the highest incidence is in recognized areas of high endemicity.

POLLITZER (p. 508) has reviewed the findings of those who have investigated carriers of cholera vibrios. Reports on the length of time during which convalescent carriers and contact carriers excrete the vibrios show considerable differences, the maximum figures for convalescent carriers varying from 13 to 42 days from the onset, and for persistence in contact carriers from 7 to 26 days. Nevertheless, the opinion is expressed that in cholera areas only the " acute " carriers, late in the incubation stage, or during the illness, or in early convalescence, are instrumental in spreading the infection.

The carrier state in cholera during the recent epidemic in Egypt was investigated by GOHAR *et al.* (p. 305), who found agglutinable vibrios in 3·56 per cent., and inagglutinable vibrios in 10·8 per cent., of contacts examined. The percentage of inagglutinable vibrios was so much higher than that previously found in the general population (1 per cent.) that the author considered every vibrio carrier, whether the vibrio was agglutinable or not, as a potential transmitter of the disease, arguing that the cholera vibrio may lose its agglutinability. This opinion, as pointed out by Taylor in comment, is unlikely to be generally accepted. Contacts excreted the vibrio for periods up to 8 days and the carrier state was not affected by treatment with various drugs or by inoculation of cholera vaccine, except in those inoculated more than 10 days before admission. The authors found achlorhydria in 75 per cent. of contact carriers, and hypochlorhydria in 16·7

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. Reference to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on cholera in this series see the January issues of the *Tropical Diseases Bulletin* each year since 1939.

per cent.; they suggest that low acidity of the gastric juice may explain susceptibility to infection.

Gilmour (p. 509) studied the excretion of *V. cholerae* by convalescents, and found that 98·1 per cent. were negative after 3 weeks. Some of these patients excreted intermittently, and the longest period of excretion was 25 days, excluding cases of reinfection. The author found reinfection or cross-infection with another strain in 4·4 per cent. of the patients.

Aetiology

In a comparison of the yield of *V. cholerae* on different solid media Koch and Kaplan (p. 510) found that a medium containing glycerol and disodium hydrogen phosphate and other ingredients which are named, gave 12 times as good a growth as plain peptone agar. In another paper these authors (p. 705) refer to the heavy growths of *Salmonella* strains on this medium.

A study of the morphology of *V. cholerae* in the various stages of its development, including the later stages when spherical forms or fusiform and pin-shaped forms are seen, is reported by Paoletti (p. 809), who describes distinct nuclei in the round forms and the technique for demonstrating them. Carrère and Roux (p. 1039) report on an Inaba strain of *V. cholerae* which produces L forms and globular bodies on incubation in nutrient broth. They have made an extensive study of these forms, and discuss their nature and significance, suggesting that the globular bodies may represent a resistant phase.

The validity of the Hikojima form of *V. cholerae*, which has the common O antigen along with the B and C antigens characteristic of the Ogawa and Inaba forms, respectively, has been questioned, and the subject was investigated by single-cell culture technique by Gallut (p. 704), who found that the Hikojima form was indeed stable and valid, though with an occasional tendency to change to the simpler Ogawa form.

Culture filtrates of *V. cholerae*, and to some extent of other vibrios, contain a collagenase, demonstrated by Narayanan and Menon (p. 26). Dudani *et al.* (p. 510) have investigated the dehydrogenase activity of *V. cholerae*.

Bandi's test, which consists of inoculating suspected material into peptone water to which high-titre cholera O serum has been added, and in which, if growth of *V. cholerae* takes place, agglutination granules may be seen in 3–7 hours, was found by Ghosal and Paul (p. 511) to be useful where there was a preponderance of vibrios in the material to be examined, but it was not reliable when other organisms predominated.

Treatment

In tests of oxytetracycline (terramycin) and chloramphenicol on cultures *V. cholerae*, De *et al.* (p. 214) found that whereas for bacteriostatic action oxytetracycline was effective at 1 μgm./ml. at *p*H 7·4, but required up to 100 μgm./ml. at more alkaline *p*H, chloramphenicol remained effective at 0·1–10 μgm./ml. within the range of *p*H tested. For bactericidal action higher concentrations were needed, but again oxytetracycline was less effective in more alkaline media of *p*H similar to that of cholera stools, whereas the action of chloramphenicol remained the same, or even increased with rise of *p*H. Das *et al.* (p. 810) treated cholera with oxytetracycline (terramycin) by mouth but concluded that it was of no additional advantage in the clinical management of the cases, though its vibriocidal activity was manifest within 24 hours. They (p. 811) went on to use oxytetracycline

intravenously, but without effect on mortality (in the small number of patients treated) or the persistence of vibrios in stools.

Chaudhuri *et al.* (p. 810) gave chloramphenicol either by mouth or intravenously in cholera with results which appeared satisfactory, though the numbers of patients treated were probably too small for differences to be very significant.

Control

In a survey of progress in the control of cholera in India, Rogers (p. 306) refers to the reluctance of the authorities in 1927 to follow his advice to institute compulsory inoculation of pilgrims travelling through infected areas, and to the excellent results which more recently have been achieved by means of inoculation alone, which is now adopted on a very large and increasing scale.

For use as a vaccine a culture of *V. cholerae* should consist of " smooth " elements, and a test has been advocated by some workers which is based on the vibriocidal action of certain batches of guineapig complement. Smooth strains resist the action of complement, but rough or partially rough strains are said to be killed by it. Gallut (p. 704) tested this on a number of strains, but the results he obtained were variable and he concluded that the method will not serve to eliminate the strains which are definitely rough. Cholera vaccine prepared in a chemically defined fluid medium has been compared by Ranta and McCreery (p. 1137) with vaccine prepared by standard methods. The protection afforded to mice was about the same, but the vaccine prepared in the special medium was relatively unstable.

Burrows (p. 1039) conducted experiments on immunization of mice. When active immunization was attempted with heterologous antigen (Ogawa or Inaba), challenge by intragastric administration of a dose of vibrio suspension which in uninoculated animals produced asymptomatic infection limited to the lumen of the bowel showed that cross-protection occurred. Immunization with homologous endotoxin was inferior to that produced by the intact antigen. Passive immunization was less effective. In chemotherapeutic tests sulphaguanidine and sulphadiazine were more effective than sulphathiazole. The implications of these findings are discussed.

It appears that the immunity is antibacterial, and if it is on an antibody basis the antibody concerned would be copro-antibody. The vibriocidal action may require the presence of complement. In later work Burrows and Ware (p. 1041) observed the response of guineapigs to active immunization, the LD50 rising 14-fold at the height of the immune response. Passive immunization was less effective. *Charles Wilcocks*

MALARIA

Unicorn Head Filmstrip: Malaria. (24 mm. × 18 mm. Catalogue No. U.57.) 1952. London: Unicorn Head Visual Aids Ltd., 40, Broadway, S.W.1. (Price 12s. 6d.)

The filmstrip consists of 51 frames, intended to be shown separately as still pictures around which a lecturer may talk. None of the photographs would be self-explanatory to an audience not familiar with the subject, however, and in an accompanying leaflet are given (in English and French) paragraphs which explain the pictures and their significance. There are several frames showing anophelines, their eggs, larvae and pupae; some are

diagrammatic, others are photographs beautifully taken. Spraying with DDT is illustrated, and this leads to a series of pictures of the antimalaria campaign carried out in Thailand in collaboration with a team from WHO, the emphasis being on ricefield malaria.

The first part of the filmstrip has a universal application, but the second part though of great local interest would hardly be applicable to countries outside South-East Asia.

The strip and the leaflet will surely be most useful and valuable to those who teach malaria to the subordinate staff of public health departments, or to school teachers. The importance of carefully prepared visual aids can hardly be overestimated, and these are very well done. *Charles Wilcocks*

Roubaud, E. Fluctuations spontanées dans la dispersion des culicides, observées dans la Vendée côtière depuis l'occupation allemande. Interprétation du problème. [**Spontaneous Fluctuations in the Distribution of Mosquitoes Observed in the Coastal Region of Vendée during the German Occupation**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 595–604. [19 refs.]

For about 30 years (except during the late war) the author has made a continuous study of the mosquito populations of the coastal region near the mouth of the river Vie, Département of Vendée, France, and since the end of the war has noted the temporary penetration into the area of numbers of *Aëdes rusticus* and, on occasion, examples of *Culex modestus*, *Anopheles plumbeus* and *Anopheles claviger*.

But the greater part of this paper is taken up with a discussion on the probable causes of what appears to be the more permanent introduction of the *messeae* and *typicus* forms of *Anopheles maculipennis* into what was formerly regarded as a purely *atroparvus* zone. The author believes that, apart from any alterations there may have been in the character of some of the breeding places, the most powerful influence was the presence, during the war, of large numbers of German troops and their animals which brought about changes in the mode of living and of housing of both man and beast.

H. S. Leeson

Draper, C. C. & Davidson, G. **A New Method of Estimating the Survival-Rate of Anopheline Mosquitoes in Nature.** [Correspondence.] *Nature.* 1953, Sept. 12, v. 172, 503.

If one dissects a number of *Anopheles* immediately after capture, one finds sporozoites in those which have already survived long enough for the cycle to be complete. If one keeps a sample until all the infected survivors are showing sporozoites, one expects a higher rate. The two may be distinguished as the " immediate " and the " delayed " sporozoite rates. The ratio between these rates " is directly proportional to the chance of survival of the mosquitoes from the time that they received an infective feed until sporozoites can be found ". It is supposed that the death rate in mosquitoes is not affected by age, *i.e.*, that a geometric progression correctly describes the relation between time and survival. On that assumption, one may establish a simple relation between the daily chance of survival and the ratio between the sporozoite rates.

The authors have applied this reasoning to samples of *A. gambiae* and *funestus* collected in East Africa on which the 2 sporozoite rates were established. They found that the average mortality of *A. gambiae* was of the order of 7 per cent. per day, that of *A. funestus* 8 per cent.

[The principle is an interesting one. Even if further work shows that the reasoning is too simple a considerable advance has been made. It may surely be found that mortality of mosquitoes is not on a simple geometric ratio: further work might demonstrate that the parasite is harmful to the mosquito at a particular point in the cycle of development.] *P. A. Buxton*

Vukasović, P. & Martinović, A. [**A Contribution to the Knowledge of *Anopheles maculipennis* Varieties in Sandžak**] *Bull. Inst. Hyg.* Belgrade. 1953, v. 2, Nos. 1/2, 64–71. [In Serbian.]

Sandjak in Yugoslavia is situated at a height of over 500 metres and surrounded by mountains. The authors therefore studied the anopheline population in this semi-isolated region by capturing female anophelines in 5 different parts of the area during July, 1952. Altogether, 579 females were captured and 74·8 per cent. of them had oviposited. The eggs were identified as belonging to the 3 varieties of *A. maculipennis*, namely *A. m. typicus*, *A. m. messeae* and *A. m. atroparvus*.

The first two varieties were found in all 5 areas, but the average number of female *A. m. typicus* (67 per cent.) was much higher than that of *A. m. messeae* (22 per cent.), *A. m. atroparvus* was found in only 3 of the 5 areas and then in small numbers (3·2 per cent.). There were also 3·9 per cent. the eggs of which could not be classified as being of any of the 3 varieties, 2·5 per cent. with eggs not sufficiently hard and 1·2 per cent. which were morphologically abnormal.

The authors observed great variation in the character of the eggs, both in different ovipositions of the same variety and in the oviposition of a single female in one night. The ovipositions of each variety were accordingly divided firstly into typical and atypical and then subdivided into groups according to the prominence of their different characters and the number of eggs per oviposition. These classifications are shown in a table in the Serbian text.

The percentage of atypical ovipositions was about 42 in *A. m. typicus*, 55 in *A. m. messeae* and 50 in *A. m. atroparvus*, which is much higher than the authors had found in any of their previous studies. This high frequency of atypical ovipositions suggests to the authors a possibility of hybridization between *A. m. typicus* and *A. m. messeae*, facilitated by the abundant population of the former. *H. J. O'D. Burke-Gaffney*

Muirhead-Thomson, R. C. **Inter-Relations between Filarial and Malarial Infections in *Anopheles gambiae*.** [Correspondence.] *Nature*. 1953, Aug. 22, v. 172, 352–3.

Recent observations by the author in the Gold Coast brought out the fact that although *Anopheles gambiae* is both a vector of malaria and *Wuchereria bancrofti*, it is unusual to find a mosquito infected with stages of both parasites. This was not only so in dissections of wild-caught *A. gambiae* but also in an experiment in which the mosquitoes were infected from a 5-year-old African child infected with both *P. falciparum* and *W. bancrofti*. Fifteen of 49 specimens were infected 10 or more days after the infecting meal but only 2 of these mosquitoes contained both mature oöcysts and mature thoracic larvae, and one was infected with both sporozoites and mature filarial larvae.

There is a brief discussion of some of the possible explanations of this fact, with due regard to the persistence of sporozoites in a mosquito and the transient nature of filarial infections. A further publication on the importance of human age-groups in Africa as a source of malaria and filarial infections to mosquitoes is in preparation and will consider more fully the particular problem emphasized in this preliminary note. *D. S. Bertram*

See also p. 119, VAN DER KUYP, **Mosquitoes of Curaçao.**

SENIOR WHITE, R. A. **On the Evening Biting Activity of Three Neotropical *Anopheles* in Trinidad, British West Indies.** *Bull. Entom. Res.* 1953, Sept., v. 44, Pt. 3, 451–60.

"Lumsden's 'standard sunset' period observations have been repeated with the 3 commonest species of *Anopheles* occurring in Trinidad. The method was modified to yield data on the ovarian and fertilisation states of these 3 species over a period of 10 months which included the dates of the latest and earliest sunset at 10°N.

"*A. aquasalis* comprised nearly 95 per cent. of a total catch of 8,592 specimens. Just over 18 per cent. of those that attacked were newly emerged, and no more than half of these were fertilised. Relict eggs, denoting a second or later gonotrophic cycle, were found in February, June and July. The 40 minutes from sunset + 20 minutes yielded nearly 80 per cent. of the total of the first two hours of activity, this period comprising nearly half the estimated total night's attack. From one hour after sunset the proportion of newly emerged specimens that attack is well below the mean. The second hour after sunset therefore provided the greatest infection risk when age, not numbers attacking, is considered.

"*A. albitarsis* has one major activity period of 20 minutes, commencing 20 minutes after sunset. Following a well marked decrease in numbers over the next 20 minutes, attack at an increased level of intensity recommenced. Less than 4 per cent. of the total number attacking are newly emerged, and the fertilisation index of these is the same as in *A. aquasalis*. There is a gap in our knowledge of the behaviour pattern of this species from emergence to second feed.

"*A. neomaculipalpus* showed almost one-third of the small total of captures to be newly emerged, but all were already fertilised."

H. S. Leeson

RACHOU, R. G., DE ANDRADE, R. M. & BORBA, A. M. Alguns dados físicos e químicos de criadouros do *Anopheles darlingi* Root, 1926 no sul do Brasil. [**Physical and Chemical Data on Water of Breeding Places of *A. darlingi* in the South of Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 361–9. English summary (8 lines).

In the northern part of the State of Paraná, Southern Brazil, *A. darlingi* is the only species of *Anopheles* which is concerned with the transmission of malaria. The insect's biology is to come under study for several years; the present paper is, we suppose, a preliminary. It sets out at length simple measurements (temperature, *p*H, chloride, etc.) on some 50 breeding places.

P. A. Buxton

Henry, X. La prémunition et les fléchissements de la résistance à l'hématozoaire. [**Premunition and Diminution of Resistance to Malaria Parasites**] *Rev. Paludisme et Méd. Trop.* 1953, June–July, v. 11, No. 107, 103–8.

The chief interest of this paper lies in its description of the fluctuations which occur in the degree of premunition in malaria cases in Algeria. Clinical signs are liable to arise when premunition declines and chronic malaria or even malarial cachexia may ensue. Such cases may be difficult to diagnose: malaria-flocculation tests are usually positive, but are less pronounced than in the acute disease and become negative when the disease has gone. In these cases, where premunition is on the wane, tissue anoxia damages the internal organs, and treatment should be directed to combat these effects. Spa treatment may be useful, but the author relies most on his "haemochromatophenol cure" which aims at establishing a solid premunition. The treatment begins with small doses of quinine or other antimalarial drug plus vitamin C and is followed by 4 injections of haemolyzed blood from the patient, to which has been added thionine and phenolsaline.

P. C. C. Garnham

i. Gaud, J. & Houel, G. Traitement collectif des manifestations épidémiques du paludisme par une prise médicamenteuse unique. [**Mass Treatment of Epidemic Manifestations of Malaria by a Single Dose of Nivaquine (Chloroquine)**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 561–5.

ii. Gaud, J. & Houel, G. Traitement individuel et traitement collectif du paludisme par une dose unique de flavoquine. [**Individual and Mass Treatment of Malaria by a Single Dose of Flavoquine (Amodiaquine)**] *Ibid.*, 565–71. [16 refs.]

In recent years there has been a marked regression of endemic malaria in Morocco. The result has been a reduction in premunition among the population with a consequent risk of epidemic outbreaks of the disease. The problem facing the authorities is how to deal with a threatened epidemic should conditions favouring such an event arise.

i. In their first paper the authors report the results of mass treatment of 50,000 persons with a single dose of Nivaquine [chloroquine] during July and August, 1951. Adults received 1·2 gm. of the drug and children lesser doses according to their age group. The results were inconsistent. In the region of Marrakesh one month after treatment there was a striking diminution in the parasite rate, but in the sector of Tazi very little reduction was observed. The results were, however, considered to be at least as good as those formerly achieved by a 3-day standard treatment with acridine derivatives. A feeling of faintness 25 to 30 minutes after taking the drug was, however, relatively frequent and in 2 cases serious toxic manifestations were observed.

ii. In their second paper the authors record 21 cases in which a single dose of Flavoquine [amodiaquine, Camoquin] was given for the treatment of febrile malarial attacks, with satisfactory results. The drug was subsequently used for mass administration in view of an epidemic of malaria in the region of Rabat in the summer of 1952. Both for personal therapy and mass administration the dosage was 0·6 gm. for those of 12 years and over, the amount prescribed for children below this age being calculated according

to age. There was no evidence of toxicity at this dosage. One month after administration of the drug there was a marked reduction in the parasite and morbidity rates. It was concluded that Flavoquine given in a single dose was an excellent drug for mass treatment in combating epidemic malaria.

In a discussion which followed SCHNEIDER remarked that his own experience and that of other workers had shown that the two 4-aminoquinolines, Nivaquine and Flavoquine, were approximately equal as regards both antimalarial activity and toxicity. He pointed out that the 2 examples quoted were not at all comparable. In the first place the observations were conducted in different places and in different years. Since in Morocco malaria is essentially a seasonal disease varying in gravity and in extent from year to year, observations carried out in one year cannot be compared with those relating to another. He remarked also on the absence of all information as to the degree of anopheline prevalence, which also varies greatly in Morocco from year to year and from region to region. Finally he commented on the differences in dosage prescribed for the 2 drugs. Infants under one year received the same dose in each case, whereas in older categories the dosage of Nivaquine became progressively higher. As much as 0·6 gm. of Nivaquine was given to children from 6 to 9 years and 0·8 gm. to those from 10 to 14 years, whereas the dose of Flavoquine for those from 6 to 12 years was only 0·4 gm. The fact that toxic manifestations were noted with Nivaquine and not with Flavoquine was therefore of no significance.

GAUD replied that it was not intended to compare the action of the 2 drugs, but merely to point out the usefulness of both of them when used as single-dose mass treatment for the combating of threatened malaria epidemics. *G. Covell*

HOEKENGA, M. T. **Treatment of Malaria with Oral or Intravenous Plaquenil. A Preliminary Report.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 805–7.

Plaquenil (7-chloro-4-[4-(N-ethyl-N-β-hydroxyethylamino)1-methylbutylamino]quinoline diphosphate) is a member of the 4-aminoquinoline group of drugs and was synthesized in 1950. It is claimed that this product is at least as effective as chloroquine and that it is considerably less toxic [see also this *Bulletin*, 1952, v. 49, 751].

In the study here reported, 82 persons of mestizo stock, representing various mixtures of Indian, Negro and Spanish ancestry, residing in or near La Lima, north-western Honduras, were treated with this drug. Sixty-eight of them (21 with *P. falciparum* infections, 47 with *P. vivax*) were given a single oral dose of 1·25 gm. Fourteen others with *P. falciparum* infections were given an intravenous dose of 0·36 gm. in 500 cc. normal saline. In most cases the temperature fell to normal within 24 hours and the blood was cleared of parasites within 31 hours. There were, however, two *falciparum* patients who did not respond to the oral dose and had to be re-treated. Another patient who received intravenous therapy for a *falciparum* infection relapsed with fever and parasitaemia 3 weeks later. No toxic side-effects were noted.

It is considered that the drug is worthy of further investigation.

[As with other antimalarial remedies, the value of this drug cannot be properly assessed until it has been tested on non-immune subjects under controlled conditions.] *G. Covell*

Manson-Bahr, P. **Treatment of Acute Malaria.** [Correspondence.] *Brit. Med. J.* 1953, Aug. 1, 284–5. [11 refs.]

In a recent letter Sir Gordon Covell states [this *Bulletin*, 1953, v. 50, 907]:

"It cannot be too strongly emphasized that, although both proguanil and pyrimethamine possess qualities which render them particularly suitable agents for the prophylaxis of malaria, neither of them should be used for treatment of the acute attack in non-immune subjects except in conjunction with some more rapidly acting schizonticide."

The present author discusses with his usual vigour the implications of this statement in the light of the history of synthetic antimalarial drugs, and emphasizes what he terms "the danger of discarding old friends for new without due consideration".

[This interesting letter should be read in the original. It is extremely difficult to summarize briefly.] *B. G. Maegraith*

Covell, G. **Treatment of Acute Malaria.** [Correspondence.] *Brit. Med. J.* 1953, Aug. 15, 392.

The author regards chloroquine, amodiaquine (camoquin) or mepacrine as the drugs of choice for treatment of acute malaria in a non-immune person. He would use quinine "only if none of these was available".

He reiterates the statement in his previous letter [above] to the effect that "although both proguanil and pyrimethamine have been shown to be highly effective in the prophylaxis of malaria, neither of them is suitable for the treatment of an acute attack in a non-immune subject without reinforcement by some more rapidly acting schizonticidal drug".

B. G. Maegraith

Coatney, G. R., Myatt, A. V., Hernandez, T., Jefferey, G. M. & Cooper, W. C. **Studies in Human Malaria. XXXII. The Protective and Therapeutic Effects of Pyrimethamine (Daraprim) against Chesson Strain *vivax* Malaria.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 777–87. [14 refs.]

The subjects of these tests were White male volunteers, none of whom had any previous history of malaria. The parasite used was the Chesson strain of *Plasmodium vivax*.

(a) *Protective trials.* Thirty-six volunteers were each infected on one occasion by the bites of 10 heavily infected mosquitoes. Twelve subjects were divided into 3 groups, the first receiving 25 mgm. of pyrimethamine, the second 300 mgm. of proguanil and the third 300 mgm. of chloroquine in a single dose once weekly, over a period of 17 weeks. The first dose was given on the day of biting. The remaining subjects received no drug and served as controls. None of those in the treated groups showed patent parasitaemia, while the controls all developed overt malarial attacks 10 to 13 days after infection.

The pyrimethamine-treated subjects all remained negative for 17 months after the last dose of the drug, but on the 515th day one of them developed fever with parasitaemia. The remaining 3 were still negative 3 months later. The proguanil-treated subjects all developed overt malaria from 10 to 17 days after the last dose and the chloroquine-treated group did so in 32 to 42 days.

In a second experiment designed to test the minimum suppressive dose of pyrimethamine, 24 volunteers were each given a single weekly dose over a period of 8 weeks. The first 2 groups received their first dose on the day of biting, the remainder 6 days before infection. Each group was bitten on one occasion only, except one of the first 2, who were infected on 3 occasions at intervals of 2 days. All dosages down to and including 0·8 mgm. were completely suppressive; break-through occurred in those given 0·4 mgm. The 3 subjects who were bitten on one occasion (by 10 infected mosquitoes) and given 25 mgm. per week remained free from evidence of infection throughout the 12-month period of observation. The 3 who were bitten on 3 occasions and received 25 mgm. weekly were parasite-free during treatment, but 2 of them developed overt malaria after the drug was discontinued.

In a third experiment 6 volunteers were bitten on one occasion by 10 infected mosquitoes and immediately afterwards 3 of them were given a single 25 mgm. dose of pyrimethamine; the other 3 received no drug and served as controls. The 3 treated subjects developed overt attacks, but not until 72, 72 and 142 days respectively had elapsed; the controls came down in 13 to 14 days. Thus though the drug did not act as a true causal prophylactic, it brought about a pronounced delay in patent parasitaemia.

To test the persistence of the drug in the body, 10 volunteers were arranged in 5 pairs. The first received a single dose of 25 mgm. pyrimethamine 37 days before infection; the second 7 days later, and so on, before the whole group was exposed simultaneously to infective bites. Controls developed overt attacks in 13 to 14 days. All but 2 of the treated subjects showed patent parasitaemia 12 to 29 days after infection. Of these two one, who received the drug 16 days before infection, developed parasitaemia after 122 days, while the other, who received the drug 9 days before infection, was still negative 7 months later.

In a further test 15 volunteers were given 25 mgm. of the drug 3 to 17 days before infection; 16 others served as controls. Transmission was effected by intravenous injection of one million parasites from a patient whose parasites had never been exposed to pyrimethamine. All controls were parasite-positive 4 days after infection; none of the treated subjects showed any evidence of infection during 7 months' observation.

(b) *Therapeutic trials. Single-dose treatment.* Twenty-six attacks in 24 individuals (9 early primaries, 11 primary attacks following suppression, 4 first relapses, 2 second relapses) were treated with a single dose of 25 mgm. pyrimethamine. Four attacks (2 early primaries, 2 primaries following suppression) were treated with a single 600 mgm. dose of chloroquine base. In the pyrimethamine series temperature fell to normal in 1 to 4 days, mean 3·0 days; the blood was cleared of parasites in 2 to 10 days, mean 5·0 days. There were 13 relapses in this group, the other 13 patients having been put on a suppressive régime before the first relapse had time to occur. In the 4 cases treated with chloroquine, the temperature returned to normal in 2 days and the blood was free from parasites after 3 days.

Single-dose treatment followed by weekly suppressive dose. Six volunteers who had developed overt malarial attacks after suppression and 7 newly infected volunteers were treated with 25 mgm. pyrimethamine on the third day of parasitaemia followed by 8 weekly doses beginning one week later. After an observation period of 419 to 557 days, only 6 of the 13 patients showed reappearance of parasites. Four of these were in a group of 4 volunteers simultaneously infected by the most heavily infected batch of mosquitoes used; this suggested that sporozoites dosage may be an important factor in determining whether or not cure results from such a drug regimen.

Single dose daily for 7 days. Ten early attacks were treated with 7 consecutive daily doses of 25 mgm. pyrimethamine. Three of the subjects had no relapse, but the remaining 7 all experienced relapses from 50 to 102 days after treatment.

The conclusion reached is that pyrimethamine is highly effective as a suppressive agent against the Chesson strain of *P. vivax*, 0·8 to 25 mgm. in a single dose once weekly giving complete protection during drug administration. It proved less efficient when used for therapy of acute attacks. It did not appear to be a true causal prophylactic against this strain of parasite, though it caused prolonged postponement of patent parasitaemia. Weekly administration for 8 or more weeks resulted in suppressive cure of many infections. It is considered that the greatest usefulness of the drug will be for routine suppression. *G. Covell.*

Myatt, A. V., Hernandez, T. & Coatney, G. R. **Studies in Human Malaria. XXXIII. The Toxicity of Pyrimethamine (Daraprim) in Man.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 788–95, 1 text fig. & 4 coloured figs. on pl. [11 refs.]

Twelve White male volunteers were each given 25 mgm. of pyrimethamine daily over a period of 49 days, representing a daily dosage of 0·27 to 0·43 mgm./kgm.

The following laboratory studies were carried out: electrocardiogram, red cell count, haemoglobin, methaemoglobin, haematocrit, white cell count, differential white count, eosinophile count, blood non-protein nitrogen, serum thymol turbidity, bromsulphthalein retention, urinalysis, urine urobilinogen, urine concentration and dilution tests, Addis count of urinary sediment and endogenous creatinine clearance. In addition marrow was aspirated from 10 of the 12 volunteers 3 days after discontinuance of the drug and again from 3 of the 10 at 50 days after the drug was stopped.

Six of the 12 subjects developed a mild to moderate anaemia of the macrocytic normochromic type, beginning about the 30th day of the test. The bone-marrow picture was of the megaloblastic type, similar to that seen in folic acid deficiency and "extrinsic factor" deficiency anaemias. The anaemia disappeared and the bone-marrow changes promptly returned to normal when the drug was discontinued.

In other studies previously reported [preceding abstract] 4 subjects received 25 mgm. of pyrimethamine weekly for 17 weeks and 19 others 25 mgm. for 8 weeks without any ill effects. The same was true of 14 subjects who received 25 mgm. daily for 7 days and 7 others who received 12·8 mgm. daily for 7 days.

As to the mechanism by which pyrimethamine produces toxicity in man, the authors point out that before one can say that the anaemia produced is due to the anti-folic and anti-folinic action of the drug, further studies are needed to show a reversal of the anaemia by folinic acid while administration of pyrimethamine and protection to toxic doses of the drug by giving concurrent folinic acid are continued.

The conclusion reached is that there is an ample margin of safety for the use of pyrimethamine in man. For use as a suppressant the drug need not be given more than once a week and in doses of no more than 25 mgm. Barring rare cases of idiosyncrasy no toxicity with this weekly dosage is likely. *G. Covell.*

Hernandez, T., Myatt, A. V., Coatney, G. R. & Jeffery, G. M. **Studies in Human Malaria. XXXIV. Acquired Resistance to Pyrimethamine (Daraprim) by the Chesson Strain of** *Plasmodium vivax*. *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 797–804, 3 figs. [13 refs.]

The subjects of this experiment were White male volunteers infected by intravenous inoculation of approximately one million parasites of *Plasmodium vivax*, Chesson strain. The strain had not previously been exposed to either pyrimethamine or proguanil.

Each subject was given a single daily dose of pyrimethamine known to be subcurative, commencing on the third day of patent parasitaemia. This amount was doubled at the end of every 7 days as long as parasitaemia persisted, to a maximum of 25 mgm. daily. If the blood became parasite-free the drug was discontinued until the reappearance of parasites, when administration was resumed at the same dosage. When the infection was transferred to a new subject initial treatment was usually at the same dosage as that employed at the time of transfer.

In testing for transfer of resistance by gametocytes, batches of 200 to 600 *Anopheles quadrimaculatus* were fed on a subject whose parasites were pyrimethamine-resistant. When sporozoites appeared in the glands each batch was allowed to feed on 2 clean subjects. When parasitaemia became patent in the recipients pyrimethamine was given at the same dosage as that employed when the insects were infected.

By this technique a more than 25-fold resistance to pyrimethamine was induced in the Chesson strain of *P. vivax*, and this acquired resistance was shown to be transferable by the mosquito. Cross-resistance to proguanil was also demonstrated, but sensitivity to chloroquine remained unimpaired. Development of resistance was, however, slow and gradual, depending on carefully controlled increases in the amount of drug administered. Moreover, when the resistant strain was transferred through the mosquito most of the parasites were still sensitive to the drug. It is therefore considered doubtful whether resistance will become a serious problem under field conditions.

G. Covell.

Jelliffe, D. B. **Relative Pyrimethamine Insensitivity in a Case of Falciparum Malaria in Jamaica.** *J. Trop. Med. & Hyg.* 1953, Sept., v. 56, No. 9, 201–2.

"A case of M.T. malaria is described occurring in a non-immune English boy resident in Jamaica. Repeated small single dose treatments with pyrimethamine (25 to 50 mg.) produced transient clinical improvement, but were followed by relapses after eight to nineteen days. It is likely that this strain of malaria was relatively pyrimethamine insensitive."

Dobrovolny, C. G., White, W. C. & Coatney, G. R. **Chloroquine and Chlorguanide as Suppressants of Malaria in Guatemala.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 808–45, 14 figs. [19 refs.]

These studies were conducted in 6 areas on the Pacific coastal plain of southern Guatemala from August 1948 to July 1950. In each area part of the population was treated with chloroquine, part with Chlorguanide (proguanil), the remainder receiving a placebo as a control. The total number of persons included in the experiment was 2,087. Four population groups were treated

weekly and 2 fortnightly. The dosage prescribed was chloroquine diphosphate 300 mgm. (base) and proguanil monohydrochloride 300 mgm. (salt), the drug being administered as a single dose in each case.

With weekly chloroquine treatment, the incidence of malaria was reduced from 23·1 to 5·3 per cent., increasing to 9·0 per cent. in the follow-up period. In the groups treated with proguanil, the parasite index dropped from 25·9 per cent. to 14·6 per cent., and was 14·5 per cent. after treatment was discontinued. In the control group the parasite index increased from 18·2 per cent. to 27·4 per cent., dropping to a low dry-season level of 16·9 per cent. in the follow-up period. Chloroquine treatments were thought to reduce the spleen index and the size of the average enlarged spleen. Proguanil did not appear to affect the spleen index, but seemed to cause a slight reduction in the average enlarged spleen.

The conclusion was reached that chloroquine more effectively suppressed both *P. vivax* and *P. falciparum* infections than did proguanil. Bi-weekly treatments with either drug were less effective than weekly treatments.

[The paper includes an account of the topography and geology of Guatemala as related to malaria, and information regarding climate and meteorology, the history of malaria in the country and figures relating to population, economic and vital statistics. Full details are given of the various observations made during the course of the investigations as well as of the preliminary surveys.] *G. Covell*

Gabaldon, A. Consideraciones sobre el futuro de la lucha antimalarica. [**Considerations on the Future of Malaria Control**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 307–18.

Observations based on the wide experience of the author, whose work will be familiar to readers of this *Bulletin.*

Gramiccia, G., Garrett-Jones, C. & El Din Sultan, G. **Band Spraying. An Experiment on Cheaper Residual Spraying in Malaria Control.** Reprinted from *Lebanese Med. J.* 1953, July, 245–56, 3 figs.

[This is an English version of the paper abstracted in this *Bulletin*, 1953, v. 50, 1009.]

Alves, W. & Blair, D. M. **An Experiment in the Control of Malaria and Bilharziasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 299–308, 1 map.

In Southern Rhodesia 2 major public health problems which require specially trained personnel for their control are malaria and schistosomiasis: fortunately transmission of each is of seasonal occurrence, the former during the rainy or wet season, the latter mainly in the dry months of the year. A pilot experiment on a field scale in the Mazoe Valley [this *Bulletin*, 1952, v. 49, 15] demonstrated to the satisfaction of the Government that residual insecticides could control malaria in what was previously a blackwater fever valley, and at the same time the application of copper sulphate to streams effected great reductions in snail populations. As a result an organization was set up within the Health Department to undertake control of both diseases in African Reserve areas.

Malaria and schistosomiasis control is directly administered by the Research Laboratory in Salisbury because the 6 field units now employed are operating in Mashonaland within reach of the city and because problems arise, the

solution of which needs an experimental approach. The African Reserve areas now under control by these units approximate to 3,000 sq. miles with a population of 203,000.

A unit has a staff of 10 Africans with a European supervisor. The latter is given a preliminary and essentially practical training, but fortunately young men of intelligence and education, attracted by the outdoor life, have taken on this work and have trained themselves to some extent in the more scientific side of their work. These men are members of the permanent establishment of the public service with salary and allowances ranging from £686 to £1,175 per annum. The Africans are virtually untrained labourers without education and are paid accordingly but receive in addition rations and uniform.

Transport for each unit consists of a one-ton truck which is capable of carrying the staff, spraying equipment and chemicals for a day's operations. The truck is fitted with a trailer attachment for a caravan, which is supplied to each supervisor as living accommodation. Base camps are set up where stores, petrol, and chemicals are dumped under canvas. The African staff are also accommodated under canvas, and when camp is moved or supplies are drawn from headquarters, a 3-ton truck normally based on the Research Laboratory is used. The spraying equipment has been standardized and made as simple as possible. It consists of " Nesthill " stirrup pumps and 4-gallon galvanized iron buckets.

Only 2 chemicals are used in the control programme, benzene hexachloride and copper sulphate, both of which are manufactured in South Africa; thus high import costs are avoided. The application of residual insecticide in remote African villages involves some prior organization to ensure the cooperation of the people; this, and some of the difficulties encountered, are discussed. Little or no cooperation of the local population is needed in snail control. Concentration of copper sulphate application on those waters, where close contact between vector snails and man is likely, minimizes the amount of work: such waters are village watering places, clothes-washing sites, roads and path crossings of streams and fords in rivers. The methods and difficulties are discussed; it is only possible to do a single spraying of any one collection of water per season.

Costs steadily increase: for one unit in 1952 they amounted to £4,915; salaries, etc., 28 per cent., equipment and materials 42 per cent., and transport 30 per cent.; 7 tons of BHC and 8 tons of copper sulphate were used. The malaria control part of the costs was £2,800. Per head of population control of malaria costs 1 shilling and 8 pence for 2 sprayings, and of schistosomiasis 1 shilling. Residual insecticide spraying costs were 3 shillings and 1 penny per hut or room. These figures do not include the central Research Laboratory's share in the work. Europeans resident in the areas pay sums closely related to the actual costs of treating their dwellings and Africans may be charged through their Councils one shilling per hut from each tax-paying male.

In other parts of Southern Rhodesia among Europeans the idea of the control of malaria by residual insecticides has been accepted; small townships and mining camps manage it by communal effort; the complete spraying of European and African domestic accommodation on farms of 2,500 acres and upwards appears to create a malaria-free " island " even when neighbouring farms are not sprayed.

Control of schistosomiasis lacks the personal and dramatic appeal of malaria control and communities make little effort to eradicate snails. The general conclusion is that satisfactory control of these 2 diseases can be

achieved only by the employment of properly organized control units and it is the intention of the Government to extend the unit system gradually until all economically important areas are covered. *R. Ford Tredre*

Mercier, S. & Razafindrakoto, J. B. Bilan de trois années de campagnes de désinsectisation domestique à Tananarive. [**Results of Three Years of Residual Insecticide Spraying in Tananarive**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 463–73, 1 map & 12 graphs (1 folding) on 13 pls.

In the municipal area of Tananarive (19°S., 48°E.), Madagascar, insecticides have been used in a continuous and systematic manner to control plague and malaria since 1949 [this *Bulletin*, 1952, v. 49, 752, 1044; 1953, v. 50, 677]. The precise objective has been to intercept the flea between rat and man and to kill the anopheline mosquito before it can become infective to man.

Plague has always been endemic in the town and its vicinity but has shown a steady decline since 1921. In 1941 there were 90 cases, in the remaining years of that decade the number varied between 16 and 30 and, after the systematic use of insecticides, the number fell to nil in 1950; in fact for 34 months no case was notified. The danger of outbreak is always present owing to the possibility of infected rats entering the outskirts of the town from the countryside. Check is maintained on the situation by the capture of rats and their examination for the presence of fleas. The proportion of *X. cheopis* among the fleas has fallen from 50–70 per cent. in the pre-DDT times to 20–34 per cent. in 1952.

The systematic application of residual insecticides has decreased markedly the incidence of malaria The authors draw attention by means of a series of graphs to the following effects of the antimalarial measures:—

(a) The fall in death rate due to malaria has been accompanied by a comparable fall in the general death rate. The curves are parallel. The death rates per 1,000 population from general causes and malaria in 1946 were 28·84 and 5·89 respectively, and in 1951 were 13·41 and 0·67.

(b) The rapid decline in malaria mortality since 1946 has resulted in 1951 in the disease becoming fifth in the list of causes of death, instead of first. It is now preceded in importance by respiratory disease and by diseases of both the digestive and circulatory systems. Chemoprophylaxis of malaria in children has contributed to this situation.

(c) Between 1931 and 1944 death rates per 1,000 varied between 20 and 30 and birth rates between 30 and 40; in 1944 they were almost the same at 34 and since have diverged steadily till in 1951 they were 13·3 and 47·8 respectively. The numbers of births and deaths in the municipal area in 1944 were approximately identical at 4,500; in 1951 they were 7,600 and 2,200 respectively.

(d) The rate of increase of the indigenous population had been steadily falling from 18 per 1,000 in 1934 to 0·3 in 1944; a sharp progressive rise has occurred since, till in 1951 the rate of increase was 32 per 1,000.

(e) A peak infant mortality rate of 224 in 1944 has steeply declined to 73 in 1951.

(f) The population of Tananarive increased from 60,000 in 1920 to over 180,000 in 1951.

The authors conclude with a comparison of vital statistics of Tananarive with metropolitan France; in 1951 birth rates were 47·3 and 19·4 respectively and death rates 13·4 and 13·3. *R. Ford Tredre*

Srivastava, R. S., Chand, D. & Singh, M. V. **Malaria Control Measures in Ganga Khadar Colonisation Scheme, Hastinapur, District Meerut, Uttar Pradesh (1948–1952).** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, July, v. 1, No. 4, 111–19, 1 map.

The Ghanga Khadar tract lies in the north-east corner of Meerut district in Tehsil Mawana and comprises low-lying land of the Ganga Valley. The area of the colonization scheme covers about 98 square miles, 40 per cent. of which has been reclaimed and distributed to settlers for cultivation. The whole tract is subject to inundations annually from the river Ganga which forms the long eastern boundary of the rectangular tract; associated with small tributaries there are reedy swamps, ponds, lakes and nullahs which are ideal mosquito breeding places. The climate is moderate with a rainy season during July to September and an average annual rainfall of 34·8 inches; maximum temperature of 110°F. occurs in December and January.

Before malaria control measures were instituted the population was about 6,000 but has since increased to 18,000. Indoor residual spraying with DDT commenced in 1948: in 1952 either DDT emulsion or 50 per cent. wettable powder was used in 2·5 per cent. strength; the frequency was 4 times a year, first March–April, second July, third and fourth at 6-week intervals after the second; the apparatus was a barrel stirrup pump with a nozzle of 1/32 to 1/24 inch aperture. The annual cost of spraying in 1951 was 1 rupee 8 annas per head. Anti-larval measures have been discontinued because of the successful results with indoor spraying. Proguanil suppression was tried in 1948 to 1950 but people, particularly women, evaded taking the drug so from 1951 it has been used for curative purposes only.

Spleen and parasite rates fell between 1948 and 1952 from 14·48 to 3·16 and from 9·35 to 1·51 respectively. *Plasmodium vivax* is the commonest parasite. There is a general decline in numbers of malaria cases, *e.g.*, in the worst month, October, for the years 1949 to 1952 inclusive; the malaria cases represented 10·24, 10·7, 7·11 and 4·4 per cent. of the total patients attending the central dispensary.

Eleven species of anopheline mosquitoes were found in the area, of which the most likely vectors of malaria are *A. culicifacies* and *A. fluviatilis*; the vector *A. stephensi* is also present in small numbers. *R. Ford Tredre*

Gilroy, A. B. **Malaria Reduction and its relation to Control Measures.** *Bull. Nat. Soc. India for Malaria & Other Mosquito-Borne Dis.* 1953, July, v. 1, No. 4, 120–26, 2 figs.

Two plantation districts in Madras State, the Wynaad and the Anamallais, have shown a uniformity in the practice of malaria control over a number of years with successful results. In these hilly areas of South India *A. fluviatilis* is the sole vector of malaria, which, in pre-control days, was serious enough to interfere with the productivity of estates, mainly tea and coffee. Old records in the Wynaad showed a juvenile spleen rate of 90 per cent. in 1926 and a monthly attack rate of 100 per thousand. In 1933 the introduction of species control by the automatic flushing of streams quickly reduced the spleen rate to 10 per cent. and the attack rate to 10 to 12 per thousand per month. A setback occurred during the war years because of the shortage of staff and materials. On 14 estates in the Wynaad with an average population of 23,546, malaria records showed the following rates for the years 1947 to 1951 inclusive:—(a) annual attack rate per 1,000: 249, 153, 45, 33, 41; (b) spleen rate per cent.: 7·1, 5·1, 2·5, 1·3, 1·2. A

combination of the residual insecticide technique with DDT and proguanil suppression was introduced in 1948 and the results obtained justified the cessation of the use of proguanil in 1951; it was obvious from the attack rate in 1947 that antilarval measures were inefficient alone but the permanent flushing systems are still kept in running order during the DDT era. DDT is applied to give a concentration of 45 mgm./sq.ft.; the first application is in January, and then every 4-weeks till the onset of heavy rains in June, which flush out the breeding places.

The comparable figures for the Anamallais group of 12 estates with an average population of 35,642 were:—(a) annual attack rate per thousand: 62, 36, 22, 13, 20; (b) spleen rate per cent.: 1·4, 1·5, remainder less than 1. Drug prophylaxis was not used and in 1950 eight estates changed from DDT to benzene hexachloride (BHC), the latter being cheaper to apply: the dosage was 11 mgm./sq. ft. gamma isomer with a spraying interval of 6 to 8 weeks. Antilarval measures had been reasonably effective for many years, which accounts for the lower initial attack rate than in the Wynaad group.

Allowing for the initial difference in severity, malaria control with residual insecticides alone has been almost as satisfactory and considerably cheaper than the use of insecticides reinforced with chemoprophylaxis.

R. Ford Tredre

Southwell-Sander, G. & Thye, J. H. J. **Anti-Malarial Drainage in the Naval Base and Establishments, Singapore.** *J. Trop. Med. & Hyg.* 1953, Aug., v. 56, No. 8, 175–83, 14 figs.

Sir Malcolm Watson evolved the methods of drainage so eminently applicable to the control of breeding of vector mosquitoes in Malaya. These methods were adopted by the naval authorities in the construction of the Royal Navy base at Singapore some decades before the advent of modern insecticides. They proved so successful in eliminating breeding waters that progressive extension of the drainage system has been continued since the last war and during the DDT era. This paper serves the purpose of reminding malariologists that such permanent measures of mosquito control are still being applied. The details of drainage may not be of much interest to the medical readers of this *Bulletin*, but the medical officer of health may find this paper most useful to hand on to members of his staff who are concerned with control of mosquito nuisance.

The authors describe the various types of drain, the practical points in their construction and the difficulties which may be encountered; good photographs illustrate the methods used at Singapore. *R. Ford Tredre*

McArthur, J. **Malaria Control in Borneo.** *Lancet.* 1953, Sept. 26, 655–6.

In 1946 the author reported that the chief vector of malaria in Malaya, *Anopheles maculatus*, was of no importance as a vector in Borneo; there *A. leucosphyrus* was the principal and often the sole vector of malaria, whereas in other countries it had been regarded as harmless. This mosquito breeds only under jungle shade so that the letting in of sunlight by jungle clearance is followed by disappearance of the mosquito.

In 1949 an experimental area of 10 square miles containing 5 villages was selected; the breeding places were defined and then cleared to admit sunlight, work which was accomplished by a gang of 50 coolies in 3 months. It was estimated that a 95 per cent. reduction in breeding of *A. leucosphyrus*

ensued. Spleen rates fell from an initial 86 per cent. to 56, 53 and 45 per cent. in successive years. Transmission of malaria was not eliminated and it is believed that infiltration of mosquitoes occurred from outside the delimited zone.

The details of earlier work have been published previously [this *Bulletin*, 1947, v. 44, 788]; a feature of this paper is the substitution of the name *A. balabacensis* for *A. leucosphyrus*: the entomological reasons for this are explained in a paper by Colless [this *Bulletin*, 1952, v. 49, 110].

R. Ford Tredre

Owens, P. N. Programas cooperativos de control de insectos en Centro América. [**Cooperative Insect-Control Programmes in Central America**] *Bol. Oficina Sanitaria Panamericana.* 1953, June, v. 34, No. 6, 611–20. English summary.

In 1949, representatives of UNICEF and WHO had various meetings and allotted a sum of $2,000,000 for amelioration of conditions in Central American countries. Of this money, the greater part was intended for programmes attacking various endemic and epidemic diseases and the remainder was to be devoted to improving nutrition and social welfare. The cooperative public health work, under the technical direction of the Pan-American Sanitary Bureau, embraced programmes in Honduras, British Honduras, Guatemala, El Salvador, Nicaragua and Costa Rica.

The principal objectives were reduction of malaria, eradication of *Aëdes aegypti* and elimination of typhus (from Nicaragua).

(1) *Malaria.* Malaria has been widely endemic for many years, the annual mortality from this disease being 14 per 100,000 in British Honduras and 150 to 400 in the other countries, in the 1930's. The principal vector in the countries concerned is *A. albimanus*. It has been mainly attacked by DDT house-spraying, in one campaign in 1950, 2 in 1951 and a third in 1952. On each occasion about one-quarter of a million houses were sprayed altogether and the total population protected was $1\frac{1}{4}$ to $1\frac{1}{2}$ million. The DDT was applied at the rate of 1·5 to 2 gm. per sq.m. and the cost per head of people protected amounted to less than 30 cents. Parasite surveys indicate a great decrease in infection rates: *e.g.*, in Nicaragua rates were 11 to 50 per cent. in 1943; 0 to 22 per cent. in 1951; 0 to 1 per cent. in 1952.

(2) *Aëdes aegypti.* This urban vector of yellow fever has largely disappeared from Central America. In Costa Rica and Nicaragua, for example, it has not been seen since 1950, and in spite of epidemics of jungle yellow fever in these countries, no single case of the urban disease has been reported.

(3) *Typhus.* Exanthematic typhus has been attacked in Guatemala by inoculations and by 10 per cent. DDT anti-louse powder. In each of 3 campaigns (1950, 1951a and b) 137,000 to 225,000 persons were inoculated and about 40,000 dusted with DDT. In 1952 about 2,000 were inoculated and 100,000 dusted. Cases of typhus (and deaths) declined as follows: 1945, 2,834 (323); 1946, 1043 (135); 1947, 251 (37); 1948, 69 (9); 1949, 26 (2); 1950, 10 (2) and 1951, 8 (0).

J. R. Busvine

See also p. 121, Rajindar Pal, *et al.*, **The Relationship between the Physical Forms of D.D.T. and their Biological Effectiveness on Water Surfaces.**

Gillette, H. P. S. **Malaria in Trinidad, its Investigation and Control, Past, Present and Future.** *Mosquito News.* 1953, June, v. 13, No. 2, 66–72. [19 refs.]

The author traces the history of malaria in Trinidad and Tobago. Surveys carried out during the war of 1939–45 showed that one half of Trinidad was practically free, but high rates existed in the north-east. The investigation showed that 13 species of *Anopheles* were to be found, but only 2 (*A. aquasalis* and *A. bellator*) were dangerous vectors. Studies on these mosquitoes have been made and are continuing. *Anopheles neomaculipalpus* may be a minor vector, and *A. albitarsis* has been suspected.

The present control programme includes clearing, drainage and larvicidal work, and much reclamation of seepage and swampy areas has been undertaken; a DDT house-spraying programme has been carried out since 1945. For *A. bellator* a technique has been developed for spraying with copper sulphate the bromeliads in which the mosquito breeds, and suitable equipment has been devised. Surveys show that " malaria rates " [probably spleen rates] have been reduced from 35–40 to 3 per cent., and from 60–83 to less than 5 per cent., according to district. Similar results have been achieved in Tobago, where *A. aquasalis* is the only vector.

Charles Wilcocks

Aragão, M. B. Aplicação do verde-paris como bromelicida. [**The Application of Paris Green to destroy Bromeliads**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 385–99, 6 figs. English summary (8 lines).

In Southern Brazil, Anophelines of the group *Kerteszia* transmit malaria. They breed in the axils of Bromeliads, a type of epiphytic plant which grows in great numbers on the branches of trees. Copper salts kill Bromeliads.

The author, using a light aeroplane, has dusted the trees with paris green. After a number of experiments, a dosage of 2·5 gm. per square metre [a large dose surely] was found necessary to kill all Bromeliads. This also causes loss of leaf from the trees, but no permanent damage.

P. A. Buxton

Edeson, J. F. B. & Davey, D. G. **Isolation of a Virulent Strain of *Plasmodium knowlesi* Sinton and Mulligan, 1932.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, May, v. 47, No. 3, 259–60.

The strain of *P. knowlesi* referred to in the title was isolated from a female kra monkey (*Macaca irus*) trapped in Negri Sembilan, Malaya. Blood films showed a mixed infection of *P. cynomolgi* and a parasite morphologically indistinguishable from *P. knowlesi*. The latter has a 24-hour schizogonic cycle. Subinoculation was made into 2 rhesus monkeys which showed parasitaemia in 5 and 8 days respectively, and died about a fortnight after subinoculation. The parasite was again indistinguishable from *P. knowlesi* and had a schizogonic cycle of 24 hours.

Subsequent subinoculations and further observations in Malaya, India and England [see below] confirmed the identity of the parasite with *P. knowlesi* as originally described by Sinton and Mulligan. The chief characteristics are listed. It is pointed out that amoeboid forms are readily seen. The infection in kra monkeys is relatively mild, although it is very

virulent in rhesus monkeys. The authors believe that chronic infections are brought about more readily by treatment with 20 mgm. mepacrine hydrochloride per 3 kgm. monkey intraperitoneally once a day than by the more commonly used quinine. Anaemia may be severe in infected monkeys and sometimes liver therapy is necessary.

The authors add that this strain (Nuri) of *P. knowlesi* in infected blood may be obtained from: The Director, Malaria Institute of India, 22 Alipore Road, Delhi, India, or Dr. D. G. Davey, Imperial Chemical (Pharmaceuticals) Ltd., Biological Laboratories, Morely, Wilmslow, Cheshire.

H. J. O'D. Burke-Gaffney

Jaswant Singh, Ray, A. P. & Nair, C. P. **Isolation of a New Strain of** *Plasmodium knowlesi*. [Correspondence.] *Nature*. 1953, July 18, v. 172, 122.

Dr. Edeson isolated in Malaya a new strain of *Plasmodium knowlesi* from *Macaca irus* [see above]. Rhesus monkeys were inoculated and the infected blood was sent to the Malaria Institute of India, where the following observations were made:—

After intraperitoneal inoculation, parasites became visible in 1 to 3 days, and after intravenous inoculation in 4 to 48 hours. Parasitaemia rapidly advanced and death occurred after 5–7 days of patency, with 90–96 per cent. infection of the erythrocytes. Ten animals in 50 showed haemoglobinuria, and all exhibited extreme anaemia and prostration. The morphology and cycle of the parasite closely resembled the original description.

P. C. C. Garnham

Edeson, J. F. B. **Presumed Exo-Erythrocytic Schizonts of** *Plasmodium knowlesi* **in the Liver of a Malayan Monkey** (*Macaca irus*). *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 399–400, 9 figs. on 4 pls.

The blood of 5 *Macaca irus* monkeys from near Tampin, Malaya, was found to contain malaria parasites, indistinguishable from *Plasmodium knowlesi*, confirmed in 3 of the animals by the quotidian cycle of schizogony in the blood and in 1 by isolation of the strain in rhesus monkeys when it was further studied by Jaswant Singh *et al.* [see above]. The livers of the original monkeys were studded with cystic bodies up to 2 mm. in diameter and consisting of merozoites surrounding a structureless colloid interior. The merozoites continued in finger-like projections around the merocyst, which, towards the poles, appeared in sections as separate bodies, resembling the "daughter cysts" described by Ray (*Proc. Nat. Inst. Sci. India*, 1949, v. 15, 241) in flying squirrels. In one monkey different stages were apparently present: (*a*) solid bodies about 100μ across, (*b*) the mature merocyst, and (*c*) the cyst undergoing degeneration with giant-cell infiltration. Cellular reaction was prominent in the last 2 stages, but was absent in the immature. The author concludes that these bodies are probably exo-erythrocytic stages of *P. knowlesi*, and points out their resemblance to similar stages in *Hepatocystis kochi* and *H. vassali*, where schizogony does not occur in the blood. The correct generic name of *P. knowlesi* is therefore in doubt, and cannot be satisfactorily settled until further details of the life cycle are elicited. [The presence of exo-erythrocytic forms of this size in *P. knowlesi* infections is difficult to reconcile with Hawking's demonstration that the pre-patent period of this species (see below) is at least as short

as 8 days. The pre-erythrocytic schizont could hardly attain such a size in this time, and it seems probable that Edeson's forms are post-mature "giants", such as Shortt and Bray (*Trans. Roy. Soc. Trop. Med. and Hyg.*, 1952, v. 46, 2) described in 15-day-old infections of *P. cynomolgi*, where the schizont grew to 3 times the normal size. It is also possible that the merocysts of *H. kochi*, etc., are later exo-erythrocytic forms, the fugitive and much smaller pre-erythrocytic parasite of such species remaining as yet unknown.] *P. C. C. Garnham*

Hawking, F. & Mellanby, Helen. **Transmission of** *Plasmodium knowlesi* **through** *Anopheles stephensi*. [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 438–9.

The Nuri strain of *Plasmodium knowlesi* was inoculated into a small rhesus monkey maintained on a milk diet plus 1/10,000 *p*-aminobenzoic acid. *Anopheles stephensi* mosquitoes (also maintained on *p*-aminobenzoic acid) were allowed to feed on the animal when the parasitaemia had reached a density of 5 parasites per oil immersion field (on the ninth day); 8 days later half the mosquitoes showed large oöcysts on the gut wall, which were followed by sporozoites lightly infecting the salivary glands 4 days later still. The sporozoites were inoculated intravenously into another monkey which showed parasites in the blood after 8 days. A further batch of mosquitoes was infected in a similar way from another monkey and 8 per cent. of them showed moderate numbers of the sporozoites 13 days after feeding. The sporozoites were inoculated intraperitoneally into a monkey which developed parasitaemia after 10 days. *P. C. C. Garnham*

Beltrán, E. & Amanda Reyes, Lydia. Infección con *Plasmodium berghei* en el ratón blanco, por vía oral. [**Oral Infection of White Rats with** *P. berghei*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Mar., v. 13, No. 1, 13–15. English summary (4 lines).

Infection of fowls, pigeons, canaries and monkeys, by ingestion of blood infected with *P. gallinaceum*, *P. relictum*, *P. cathemerium* or *P. cynomolgi* has been reported by various workers. The present authors now record successful infection of 3 of 4 white rats which were given by mouth blood parasitized to the extent of 35 or 40 per cent. by *P. berghei*. The amount of blood administered was 0·5 cc. and it was given from a hypodermic syringe provided with a curved blunt needle, with which it was possible to prevent any lesion during the operation. *Charles Wilcocks*

Mackerras, M. J. **Suppression of** *Plasmodium berghei* **in Rats on a Milk Diet.** [Correspondence.] *Australian J. of Sci.* 1953, Aug., v. 16, No. 1, 24–7, 3 figs.

Albino rats 6 weeks old were kept on a diet of pasteurized milk plus vitamins (B_1, B_2 and pantothenic acid) for 10 days. They were then infected with *Plasmodium berghei*. Few parasites were seen during the first 10 days, and in 4 out of the 6 rats, suppression was complete until this time; then considerable parasite waves of short duration arose, disappearing however during the fourth week of infection. Two control rats on ordinary diet reacted in the usual way to the infection, and died of the disease on the 16th and 17th days respectively. Similar experiments were carried out

with *Trypanosoma lewisi*; the resultant infections here were practically identical in both control and milk-fed animals, and there was no evidence of suppression of this parasite, which the author thinks is able to multiply in the absence of some factor which is required on the other hand by *P. berghei*. [See this *Bulletin*, 1953, v. 50, 384; also results with *T. congolense* by Keppie, p. 33, below.] *P. C. C. Garnham*

Box, Edith D., Celaya, Bettie L. & Gingrich, W. D. **Development of *Plasmodium berghei* in *Anopheles quadrimaculatus*.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 624–7, 2 figs.

Anopheles quadrimaculatus were fed on white mice and voles (*Microtus p. pennsylvanicus*) which had been infected with the Kasapa strain of *Plasmodium berghei* 2 to 7 days previously. The animals showed about 1 to 4 gametocytes per 1,000 erythrocytes and the male parasites exflagellated well. All the mosquitoes which had fed on mice on the second and third days became infected, but the rate diminished on the fourth day and was negative later. Infections were obtained from feeding on 6 out of 9 voles, 4 days after the animals had been infected. Mosquitoes were kept at either 21°C. or 26°C. Hundreds of oöcysts appeared on the gut wall and sporozoites appeared as early as the sixth day, but never reached the salivary glands. This indicates that *A. quadrimaculatus* is an unsuitable vector of the parasite. *P. C. C. Garnham*

Whitfeld, P. R. **Studies on the Nucleic Acids of the Malaria Parasite, *Plasmodium berghei* (Vincke & Lips).** *Australian J. Biol. Sci.* 1953, May, v. 6, No. 2, 234–43, 2 figs. [22 refs.]

The nucleic acids of malaria parasites have not so far been studied to any great extent. Deane has shown by staining techniques that deoxyribose nucleic acid (DNA) is present in *P. knowlesi* and *P. vivax* (*J. Cell. Comp. Physiol.*, 1951, v. 26, 139). Ball *et al.* [this *Bulletin*, 1949, v. 46, 117] have described the variations in total nucleic acid phosphorus in the red cells of rhesus monkeys infected with *P. knowlesi* and showed that there was a considerable increase of these acids compared with that in normal cells during infection.

In the present investigation the ribonucleic acid (RNA) and the DNA content of *P. berghei* have been determined as well as the proportion of their constituent purines and pyrimidines. Infected blood was obtained from white mice before the terminal stage of this fatal infection was reached in order to avoid the marked haematological changes which occur in parasitized blood. The estimations of nucleic acids were made by standard methods on the residues from normal and parasitized blood after haemolysis with saponin, normal blood being included in order to allow for the amounts of RNA and DNA present in leucocytes. The increase in these substances due to the presence of parasites could thus be calculated. The mean value of RNA per parasite was found to be $1{\cdot}09 \times 10^{-7}$ μgm. and that for DNA $0{\cdot}54 \times 10^{-7}$ μgm. when the parasites present were mainly in the late segmenting or early trophozoite stages.

The absorption spectrum of the nucleic acid obtained by saline extraction of free parasite corresponded with that of yeast nucleic acid. The purine and pyrimidine bases present in *P. berghei* nucleic acids were the same as described for RNA (yeast) and DNA (thymus) but the proportions of the

bases present differed. 5-methylcytosine was not detected in the parasite DNA. The DNA belonged to what has been described as the " AT " type, in which the concentration of adenine and thymine exceeded that of guanine and cytosine. *J. D. Fulton*

Manresa, M., Jr. **The Occurrence of Phanerozoites of** *Plasmodium lophurae* **in Blood-Inoculated Turkeys.** *J. Parasitology.* 1953, Aug., v. 39, No. 4, Sect. 1, 452–5.

Eighty-eight bronze turkeys (6–32 days old) were inoculated with *Plasmodium lophurae* and exo-erythrocytic schizogony was observed in smears of brain but of no other organ. White turkeys failed to show this form of the parasite. The intensity of infection was measured by counting the number of schizonts seen in 100 lengths of blood vessel traversing the oil immersion field (97x). Phanerozoites were found in the brain of 60 per cent. of turkeys during the 15th to the 24th days after infection, a period when the blood infection had practically disappeared. The greatest density of exo-erythrocytic forms was from the 18th to the 21st days, with a maximum index of 358. Sex had no influence on these forms, nor had artificial inoculation of immune plasma collected from ducks or turkeys which had recovered from the disease. [Becker and Manresa had already briefly reported (*Iowa St. Coll. J. Sci.*, 1950, v. 24, 353) the existence of phanerozoites of *P. lophurae*; otherwise only pre-erythrocytic schizogony of this species had been described (Huff, *et al.*, this *Bulletin*, 1947, v. 44, 1046).] *P. C. C. Garnham*

McGhee, R. B. **The Infection by** *Plasmodium lophurae* **of Duck Erythrocytes in the Chicken Embryo.** *J. Exper. Med.* 1953, June 1, v. 97, No. 6, 773–82, 3 figs.

Duck erythrocytes washed and suspended in normal saline solution were inoculated into chick embryos of less than 14 days' incubation and infected with *Plasmodium lophurae* 2 or 3 days previously. The corpuscles of the 2 birds are distinguishable by the spherical nucleus of the chick embryo erythrocyte in contrast to the elliptical nucleus of the duck's. The duck cells during the first 4 hours became increasingly parasitized, while the numbers of parasites in the chick cells remained about constant. By 24 hours, the degree of parasitization of the 2 sets of erythrocytes was approximately the same. It was then shown statistically that the merozoite death rate was not much altered when duck erythrocytes were introduced early in the infection, but if introduced later when parasitaemia was higher, the death rate of merozoites was lowered, as compared with embryos which were not given duck erythrocytes. This suggested that infected chick erythrocytes were less susceptible to invasion by merozoites, and this hypothesis was confirmed by inoculating duck cells already infected with the parasite into infected embryos. The results showed a decreasing rate of penetration *pari passu* with the degree of parasitization already present, until no further infection of corpuscles would occur when 84 per cent. were infected. The author concludes that the death rate of merozoites is reduced if new susceptible erythrocytes are provided; if on the other hand the new erythrocytes already contain parasites, some barrier to penetration (*e.g.* an alteration to the cell membrane) is present, and the death rate will remain high. [See also this *Bulletin*, 1953, v. 50, 681.] *P. C. C. Garnham*

Laird, M. *Plasmodium vaughani* **Novy and MacNeal, 1904, in the New Hebrides: with a Note on the Occurrence of** *Elongatum*-**Type Exoerythrocytic Schizogony in this Species.** *J. Parasitology.* 1953, Aug., v. 39, No. 4, Sect. 1, 357–64, 32 figs. on pl. [15 refs.]

Plasmodium vaughani was identified in 2 subspecies of the Yellow White-eye (*Zosterops flavifrons*) of the New Hebrides. The erythrocytic stages of the parasite are described—three quarters of the schizonts possess 4 nuclei and the remaining one-quarter up to 8; immature gametocytes often show pseudopodia, and mature forms are elongate and are almost colourless after Giemsa staining. Exo-erythrocytic stages of *elongatum* type were found in basophile and polychromatophile erythroblasts, small and large lymphocytes, normoblasts, myelocytes, and in wandering macrophages. These forms were without pigment, were larger than erythrocytic schizonts while having a similar number of merozoites, and were apparently subject to phagocytosis by the host cells, where necrotic remnants were found in birds showing heavy infections of the parasite. The paper concludes with a useful summary of the distribution of this widespread avian species (North and South America, Europe, Africa, Asia and now Polynesia).

P. C. C. Garnham

Huff, C. G. **Observations on** *Plasmodium huffi* **Muñiz, Soares and Batista.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 620–23.

Muñiz *et al.* [see this *Bulletin*, 1952, v. 49, 604] described a new malaria parasite of toucans in Brazil which developed not only in erythrocytes, but in thrombocytes, lymphocytes, granulocytes and macrophages. The present author made further studies on smears and sections of infected birds, and thought that the lymphocytes were the principal site of invasion in the bone marrow and spleen (rarely the peripheral blood). The exo-erythrocytic schizonts were spherical and contained as many as 75–100 merozoites; up to 5 schizonts were seen in a single host cell. The nucleus of the latter became altered—pyknotic and much lobulated. Erythrocytic schizonts usually had 6 to 8 nuclei, and the parasite thus appeared to belong to the " small avian " group, though it is thought that the strain may not have been pure. [Huff states that, as Manwell showed (*J. parasitol.*, 1951, v. 37, 319), at least one of the " small avian " parasites (*P. hexamerium*) shows exo-erythrocytic schizogony of the *gallinaceum* type; Laird (see above) has now shown that in another of the group—*P. vaughani*, exo-erythrocytic schizogony is of the *elongatum* type, like *P. huffi*.]

P. C. C. Garnham

Ray, A. P., Bhatnagar, V. N. & Menon, M. K. **A** *Plasmodium* **in Common Indian Partridges.** [Correspondence.] *Nature.* 1953, Oct. 10, v. 172, 687.

Wild partridges (*Francolinus pondicerianus interpositus*) were examined during a routine survey of birds found in the Delhi area in the winter. These birds are widely distributed in India and are locally known as *titar*. In some of them a species of malaria parasite was found. Gametocytes and all asexual stages were seen in the erythrocytes. The parasite apparently resembles *P. polare* described by Manwell from a cliff sparrow in 1935 [this *Bulletin*, 1936, v. 33, 237]. Infection was invariably slight, but it could always be passaged to fowls and chicks by blood inoculation from

infected partridges. The infection was subsequently transmitted from partridge to fowl and from fowl to fowl through *Aëdes aegypti*. The strain has been maintained in fowls and is being studied further. This is believed to be the first plasmodial infection reported in Indian partridges.

H. J. O'D. Burke-Gaffney

Tarshis, I. B. **Oöcyst-Like Bodies on the Midgut of *Stilbometopa impressa* (Bigot) (Diptera: Hippoboscidae).** *Science*. 1953, Aug. 21, v. 118, 199–202, 8 figs. [14 refs.]

Nodules were found on the midgut of the quail louse fly (*Stilbometopa impressa*) in 85 per cent. of specimens. These superficially resembled oöcysts of a haemosporidean parasite and were thought at first to arise from *Haemoproteus lophortyx* present in the blood of the host birds. The following considerations showed that this was a wrong interpretation:—

Flies fed on uninfected quail showed the nodules, as did newly emerged, unfed flies. The nodules were not on the wall itself, but were attached to opaque plaques, girdling the sausage-shaped portion of the midgut. The size of the nodules varied from 3 to 218 μ; their contents were numerous Gram-negative bacilliform objects, occuring singly or in chains. These organisms could not be cultured and were thought to be symbiotes. [The author refers to earlier observations on the sporogonic cycle of *Haemoproteus* in hippoboscid flies, and is critical of the validity of some of them. But true oöcysts of *Haemoproteus* are unmistakeable, and in most of the previous work (*e.g.* Adie's, this *Bulletin*, 1925, v. 22, 279) they have been watched until the sporozoite stage.] *P. C. C. Garnham*

TRYPANOSOMIASIS

West African Institute for Trypanosomiasis Research. **Annual Report 1952** [Mulligan, H. W., Director]. 33 pp. 1953.

The work recorded in this annual report is of great interest. Space prevents mention of more than a few of the more important findings.

Entomological research. The long-term investigation of the ecology of *Glossina palpalis* in Northern Nigeria previously reported [this *Bulletin*, 1953, v. 50, 607] has been concluded and the results published. A finding of epidemiological importance is that during severe dry seasons the fly is concentrated around permanent pools where an equable microclimate exists and near which villages are sited. Fly-man contact is then intimate and optimal for the transmission of sleeping sickness. Studies of the ability of this fly to withstand high temperatures averaged over 10-day periods were made on captive specimens kept in the stream-bed. The results suggested that when maximum shade temperatures of 93° to 95°F. were reached and maintained, partial clearing of the vegetation round the permanent pools would eliminate the fly. A new method of bush-clearing against *G. palpalis* is suggested; the trees forming the canopy are felled into the stream-bed which they block, obstructing the flight of the fly and removing its overhead insulation from the sun. This "obstructive" clearing, where it is suitable, would greatly reduce the cost of initial clearing and maintenance.

A serious extension of *G. morsitans* in Northern Nigeria is reported, against which counter measures are being taken.

Epidemiological research. An investigation in the Gambia showed that the prevalence of wells, the absence of a fishing industry and the rare use of local craft for water transport, are factors tending to limit transmission of sleeping sickness there. The disease is highly endemic only among rice cultivators who are in close and personal contact with *G. palpalis* while on their farms. In Sierra Leone fly are less prevalent than in the Gambia, and in the rain forest belt sleeping sickness is endemic only in scattered foci. In the transitional and savannah zones, however, fly are widely distributed along the rivers and streams, and the establishment of a focus of infection is likely to result in epidemic spread. This occurred in the Kissi area where population density was high, fly-man contact was personal and sustained, and on introduction the disease spread rapidly.

Chemotherapy and chemo-prophylaxis. Pentamidine prophylaxis has been tried in Zaria Province where a population of 2,500 was protected for a period of 9 months during which time 9 cases occurred in an adjacent control group. Further field trials are being studied.

The results of Antrycide methyl sulphate in the treatment of animal trypanosomiasis have been studied. The dramatic results immediately following treatment have made the drug popular among cattle owners, but immediate and delayed toxic reactions have been noted. Antrycide Pro-salt has been shown to protect cattle in constant contact with riverine fly and those in transit through fly belts, but this prophylactic treatment is generally limited to 6 months for fear of inducing drug resistance. Small herds have, however, been kept on this prophylactic treatment continuously for nearly 2 years with satisfactory results. Resistance to Antrycide methyl sulphate has been created experimentally and is being studied. Several other new compounds and salts for the treatment of animals are being investigated.

Protozoological research. Trypanosoma vivax infection is of major economic importance among cattle in West Africa. The infection of rats with this parasite after injection of sheep serum, already recorded [this *Bulletin*, 1953, v. 50, 607], has now been carried on for 130 serial passages. At the 37th passage it was found possible to infect rats without preliminary injection of sheep serum. This " unsupplemented " line has now been maintained for 120 serial passages.

There are 4 Appendices giving a list of the scientific papers by the staff, a list of the members of the Managing Committee, a list of distinguished visitors to the Institute, and a statement of its income and expenditure for the year 1951–52. *T. H. Davey*

McLetchie, J. L. **Sleeping Sickness Activities in Nigeria, 1931–1952. (Parts I & II.)** *West African Med. J.* 1953, Apr.–May–June & July–Aug.–Sept., v. 2 (n.s.), Nos. 2 & 3, 70–78; 138–50, 1 fig. [64 refs.]

This paper reports on the work of the Nigerian Sleeping Sickness Service from the time mass treatment campaigns were commenced in 1931 until the present day. It is believed that there were 2 original foci of infection from which, after the British occupation, the disease spread out in the first 2 decades of this century and became a major problem in the third. Mobile teams for mass survey and treatment were trained in 1930 and in the next 10 years an incidence of 10·9 per cent. was recorded among 2,756,343 people examined at new surveys. Between 1941 and 1952 919,783 people were surveyed at new surveys in whom the incidence was 1·6 per cent. in the

first 5 years and 0·3 per cent. in the second. During this period the strains of *Trypanosoma gambiense* appeared to become more virulent with earlier involvement of the nervous system, but even those with the milder infections were liable to death from sudden toxaemic breakdown.

In Nigeria gland puncture, supplemented by examination of a reasonable sample of blood films from the population, was the usual method of diagnosis. Unless a substantial proportion of cases can be diagnosed by blood examination it is too laborious for routine use. Occasionally, however, a strain is encountered in which infection is demonstrable in the glands in only a small proportion of cases; in such circumstances blood films from all suspected cases must be examined.

The condition of the cerebrospinal fluid is the only indication of prognosis; the total protein content is significant in determining treatment, and the cell count in assessing the result. The criteria for the classification of patients in Nigeria were as follows: early cases were those with cell counts of 3 per cmm. or below and total proteins not more than 25 mgm. per cent.; intermediate cases showed either or both these readings raised, but below 40; advanced cases had either or both these readings above 40. In estimating the results of treatment, any finding above 5 cells or 25 mgm. total protein was regarded as failure or relapse except in cases where the original cerebrospinal fluid examination showed gross abnormality. Where lumbar puncture was not done the patient, even in the absence of clinical signs, was assumed to have an abnormal cerebrospinal fluid and was treated accordingly.

The standard treatment in Nigeria was antrypol and tryparsamide consecutively or concurrently, but latterly pentamidine isethionate was replacing antrypol. Field trials of malarsen have been promising and this drug appears to offer hope in cases previously considered incurable.

Eradication of the vector is the only permanent means of control of sleeping sickness but it is not always possible. Mass treatment and chemoprophylaxis have priority in the control of major outbreaks. The former must be reinforced by the provision of dispensaries and by re-survey. The dispensaries do valuable work but the important transmitters are the relatively healthy early cases and these can only be detected on survey. There has been no large-scale use of chemoprophylaxis in Nigeria except in mining camps.

The riverine tsetse, *Glossina palpalis* and *G. tachinoides*, are the important local vectors. Fly control methods have passed through 3 phases. Initially, short, ruthless clearings were made at strategic points, but subsequently eradication of fly was attempted over a relatively small area combined with resettlement and economic development. The most recent method is eradication of the fly from complete stream systems in savannah country followed by planned agricultural development. Further reduction of sleeping sickness in Nigeria by mass treatment is unlikely and progress will only come through vector eradication. *T. H. Davey*

Scott, D. **A Note on Sleeping Sickness Control in North-West Ashanti (Gold Coast).** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 405–9, 1 map.

In 1949, in a part of the Northern Territories of the Gold Coast, a reduction of 80 to 97 per cent. in sleeping sickness incidence over a period of 8 years was reported, which was largely a result of eradication of *Glossina*

palpalis by selective clearing [this *Bulletin*, 1950, v. 47, 19]. This paper deals with the distant effect of these measures combined with a mass treatment campaign in an area of Ashanti, 200 miles to the south. Throughout Ashanti the incidence of human trypanosomiasis is less than 0·5 per cent. except in the areas along the 2 main traffic routes joining Kumasi (Ashanti) to the western and eastern parts of the Northern Territories. Along these thousands of migrants pass annually, of whom 2 per cent. were shown to be infected in 1938. The region between Ashanti and the Northern Territories is sparsely inhabited and little affected by sleeping sickness. Between 1940 and 1943 a trypanosomiasis survey, followed by a single mass treatment, was carried out in an area of Ashanti extending for 100 miles along the western road to the Northern Territories, and some 10 to 20 miles wide, and also in a contiguous area beyond the influence of this main traffic route, which appeared to show similar conditions for transmission of the disease. A second survey was carried out in these areas in 1950–51 when an 80 per cent. reduction in incidence was recorded.

It was important to determine whether this reduction resulted from a decrease in local transmission of the disease or to a decrease in the number of imported cases included in the surveys. When the persons who had been examined in the surveys were classified as Ashantis or others, it was found that among Ashantis a much greater reduction in trypanosomiasis incidence had occurred, from 0·78 to 0·08 per cent., while among non-Ashantis it fell from 1·6 to 0·37 per cent. The non-Ashantis showed, however, a greater proportion of males who are the most heavily infected group in the Gold Coast. In order to assess the epidemiological importance of the main road to the north, a further comparison was made between Ashantis living in the area through which the road passed and those in the contiguous area separated from the road. Among the former the percentage incidence fell from 0·87 to 0·08 and in the latter from 0·47 to 0·05 per cent.

It is regarded as unlikely that a single mass treatment could have effected such a lasting reduction among the Ashantis and, since no fly-control was attempted in the area and treatment facilities outside the area remained unaltered, the fall in incidence must have resulted from action outside Ashanti. The cause was probably the concerted attack on the foci of epidemic sleeping sickness in the Northern Territories in consequence of which the main source of infection was withdrawn and a reduction in the incidence of the disease amongst the Ashanti people followed.

T. H. Davey

Soltys, M. A. **Golden Jubilee of the Discovery of Sleeping Sickness in East Africa.** *East African Med. J.* 1953, Sept., v. 30, No. 9, 389–92. [13 refs.]

This general article provides an interesting account of the history of research in East Africa on human and animal trypanosomiasis since 1903, the year when trypanosomes were first shown to be the causative organism of the disease. Not only is the course of research on causation and control outlined, but the reader will appreciate the progressive coordination of effort and resources which has taken place during the years in the organization of laboratory and field work on tsetse fly and trypanosomiasis. This is particularly true of the past few years and applies both to East and West Africa. The facilities now existing should provide, moreover, for more attention to the trypanosome which has been studied less comprehensively in the past than the tsetse-fly and its control. *D. S. Bertram*

Von Brand, T., Tobie, Eleanor J., Mehlman, B. & Weinbach, E. C. **Observations on the Metabolism of Normal and Arsenic-Resistant** *Trypanosoma gambiense*. Reprinted from *J. Cellular & Comp. Physiol.* 1953, Feb., v. 41, No. 1, 1–22, 8 figs. [28 refs.]

This study was undertaken to try to determine whether the changes which arise in drug-resistant trypanosomes are metabolic in character or depend on some change in permeability. Data have now been presented on the mechanism of glucose utilization by *T. gambiense* and quantitative comparisons made on the amount used by the 2 strains of the parasite, the production of end products and reaction to inhibitors. The method of producing resistance *in vitro* was that of Yorke *et al.* [this *Bulletin*, 1932, v. 29, 293] and the resistance acquired proved to be a stable character. Oxygen and glucose consumption, and pyruvate production, were measured in both strains either in saline and rabbit serum or in saline and rat blood. It appeared that glucose metabolism and pyruvate production were lower in the resistant strain whereas oxygen consumption was the same as in the normal strain. The molar ratios between glucose and oxygen consumed and pyruvate produced was 1 : 1 : 2.

With manometric techniques inhibition experiments were all carried out on whole blood for periods of 40 minutes at 37°C. It was found that the degree of resistance to reduced tryparsamide greatly exceeded that to mapharsen. It was of interest that a minor degree of resistance to sodium arsenite was apparent. Besides these arsenicals, experiments with iodoacetate and iodoacetamide, also regarded as –SH inhibitors, showed that both strains were affected in like degree and this indicates absence of excess –SH groups in the resistant strain. Similar results were obtained in both strains with fluoride, cinnamate, malonate, and fluoroacetate. The resistant strain appeared to be slightly more sensitive to cyanide and much more so to nitrofurans than the normal strain but both were equally so to azide. To galyceraldehyde which inhibited the oxygen uptake of both strains the resistant type was somewhat less sensitive.

The authors concluded that arsenic resistance involved a change in permeability of the parasite and possibly also an alternate metabolic pathway rather than a fundamental change in those existing. *J. D. Fulton*

Friedheim, E. A. H. **The First Case of Highly Drug Resistant African Sleeping Sickness treated in the United States of America.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 634–6.

A White American doctor, aged 26 years, was infected with, presumably, *Trypanosoma gambiense* in the Belgian Congo in 1929. Parasites at that time were seen in the blood and lymph gland juices; there was no clinically detectable involvement of the central nervous system, and the cerebrospinal fluid [CSF] was not examined. Treatment with 25·5 gm. of tryparsamide given during 17 weeks failed to clear the parasites from the peripheral circulation, but a course of tartar emetic treatment did so. The disease, however, progressed in spite of further treatment with tryparsamide and with Bayer 205 [Antrypol] into the second stage, over a period of 3 years. By this time there was a CSF cell count of 20 cells per cmm., with insomnia, drowsiness, headache and neuritic pains. A further intensive course of tryparsamide treatment resolved the symptoms, and in 1934 the CSF cell count being normal the patient was held to be cured. By this time he had had 118·5 gm. of tryparsamide, 16·5 gm. of Bayer 205 and 3·5 gm. of tartar emetic. For 4 years thereafter he remained well.

In 1938 he returned to the Congo and within 2 weeks of his arrival in an endemic area he developed fever, and trypanosomes again were recovered from his blood and lymph glands. In spite of 5 courses of tryparsamide treatment the parasites persisted in his blood for 2 years. By this time he had returned to the U.S.A.; further tryparsamide treatment to a toxic level did not materially benefit him, so the patient refused further chemotherapy.

He practised his profession for 7 years, until in 1947 increasing nervous symptoms caused him again to seek advice. He was now given a course of pentamidine injections, and the following year a course of 24 injections of *p*-arsinophenylbutyric acid (Eagle 70A). His condition, after temporary improvement, deteriorated until he was bed-ridden and the CSF contained large numbers of trypanosomes. By this time he had had 140 gm. of tryparsamide, 1 gm. of pentamidine and 24 doses of Eagle 70A. As a result of the tryparsamide treatment his visual fields were contracted.

In September 1948 he was given 8 intravenous injections of Mel B; one month later his CSF was normal; clinically he was much better; and he resumed his full normal work. On re-examination after 2 years and again after 4½ years he was perfectly well and engaged in the full-time practice of a surgeon.

That this was a case in which 2 separate infections occurred, and not a late relapse of the first, seems to be clear from the fact that on the second occasion large numbers of trypanosomes appeared first in the blood and glands, after normal CSF findings. Both infections were largely resistant to tryparsamide and other drugs. The first infection was brought by treatment to a precarious equilibrium, until after 5 years further very intensive treatment eradicated it. The second was of extreme virulence, as indicated by the rapid and early involvement of the central nervous system, and it also was temporarily arrested by tryparsamide treatment but persisted over the extraordinarily long period of 7 years. This infection was refractory to tryparsamide and also, of course, to pentamidine, Bayer 205 and Eagle 70A in the second stage; but was eradicated by a short course of Mel B treatment. The melaminyl compounds affect a different biochemical system of the parasites and one which is independent of the tryparsamide " receptor " [this *Bulletin*, 1950, v. 47, 333]. This case confirms that a cured trypanosome infection confers no immunity to reinfection, and that it does not mitigate the severity of the second infection when this occurs. *A. R. D. Adams*

Glasgow, J. P. **The Extermination of Animal Populations by Artificial Predation and the Estimation of Populations.** *J. Animal Ecology.* 1953, May, v. 22, No. 1, 32–46, 1 fig. [24 refs.]

The term " artificial predation " includes cases in which a population of animals is directly attacked by man (the predator) by such methods as shooting or hand collecting. The author considers a number of cases in which this has occurred and in which the prey has been exterminated, and others in which it has not. The success of the operation depends upon many things: for instance, very mobile animals are less easy to exterminate than immobile ones: slow-breeding mammals and a few sorts of insect have been exterminated, whereas rapidly breeding insects present great difficulties. In general terms one may expect the extermination to follow a geometrical progression, another way of saying that the same proportion of the prey animals will continue to be killed in successive intervals of time. One may, however, expect a departure from a geometrical progression when the prey

becomes very rare: the angler does not continue to fish the stream when the trout are very rare.

The author has had much experience of experimental controls of *Glossina palpalis* in East Africa. He takes his own figures for an experiment in which this insect was attacked by catching on the banks of a river and quotes the numbers week by week for 23 weeks. Because there was a considerable proportion of puparia in the soil at the commencement, the number of young "teneral" flies remained nearly constant for a period. The catch of non-teneral males and females declined steadily and it was found that the effect of the predation upon them might be expressed as a geometrical progression. There was, however, a complication due to immigration from an area in which control was not taking place. It would be supposed, and the figures support this view, that the number of immigrants was roughly constant throughout the period because they came from an uncontrolled area and had not been subjected to artificial predation. The proportion of immigrants to the total population was therefore very small at first; it became considerable as the numbers of flies were reduced by hand catching, so that here again the diminution did not strictly follow a geometric series.

The paper is an excellent example of one type of modern entomology in which theoretical expectations are critically compared with results obtained in practice. *P. A. Buxton*

Hocking, K. S. & Yeo, D. **Aircraft Applications of Insecticides in East Africa. I.—Preliminary Experiments in Areas supporting Populations of the Tsetse Fly** (*Glossina palpalis* **(R.–D.)**). *Bull. Entom. Res.* 1953, Sept., v. 44, Pt. 3, 589–600, 3 figs.

The possibility has been investigated of controlling the tsetse *G. palpalis* by the application of coarse sprays or coarse aerosols of insecticides from aircraft. Preliminary trials were made in open country to determine the characteristics of the deposits from the sprays and aerosols. The sprays were produced from emulsions containing 0·20 lb. per gall. of p,p′DDT or 0·032 lb. per gall. of *gamma* BHC. They were emitted, by the force of gravity, by 2 wide pipes under the aircraft, at the rate of 1 to 2 gall. per acre. The aerosols were produced from solutions in a 1:4 mixture of furnace oil and kerosene containing either 10 per cent. DDT or 1·3 per cent. *gamma* BHC. Atomization was obtained by a venturi duct in the exhaust pipe and the rate of application was 0·2 to 0·4 gall. per acre. Both sprays and aerosols were applied from Anson Mk. I aeroplanes.

Ground recoveries of the sprays were estimated chemically, colorimetrically and by splash marks on paper, all methods agreeing reasonably well. The MMD (mass mean diameter) of the droplets was about 0·7 mm. and the percentage recovery on the ground varied from 60 to 80 per cent. when the sprays were emitted at 130 to 200 ft. and 40 to 50 per cent. at 200 to 300 ft.

Assessment of ground deposits from aerosols was difficult because the lower range had to be measured with a cascade impactor and the upper range with coated slides. It appeared that the MMD was about 50 to 100 microns. The ground recovery varied greatly with meteorological conditions, but was generally about 10 per cent.

Further trials were made on 4 islands in Lake Victoria, about 100 to 250 acres in extent, well infested with *G. palpalis* and reasonably isolated. Two islands were treated with spray and 2 with aerosol, one of each being DDT

and the other BHC. The islands were surrounded by swampy ground with reeds, followed by low trees and eventually dense tropical forest. Open areas were few. Measurements of deposits in the open areas of the islands gave values slightly lower than in the preliminary trials, probably because of the shade of surrounding forest. Inside the forest the deposits were greatly reduced. Spray residues were very patchy, but generally were less than 5 per cent. of the open areas. Aerosol residues in the forest were somewhat more even, but again were only about 5 to 10 per cent. of the nominal area dosage. The effects on the tsetse flies were judged by regular fly rounds and by the release of marked flies to estimate total population on the basis of recaptures. The figures were corrected for seasonal variation by comparison with data from untreated neighbouring control islands. Eight applications were given at intervals of 2 weeks. In the last 2 or 3 treatments the dosage was somewhat increased in all cases.

The results were disappointing. The reduction in populations by DDT aerosol was about 50 per cent. and by *gamma* BHC slightly more. Reduction by the sprays was only about 10 to 20 per cent. It is concluded that control of *G. palpalis* by aircraft would require much heavier doses and more frequent applications and would probably be impracticable.

J. R. Busvine

Hocking, K. S., Parr, H. C. M., Yeo, D. & Robins, P. A. **Aircraft Applications of Insecticides in East Africa. II.—An Experimental Attempt to produce a Fly-Free Corridor through a Belt of Tsetse-Infested Woodland.** *Bull. Entom. Res.* 1953, Sept., v. 44, Pt. 3, 601–9, 4 figs.

In certain areas in Africa there are large seasonal movements of cattle from one grazing area to another. The animals are moved along well-defined stock routes, which sometimes pass through tsetse-infested belts and expose the cattle to trypanosomiasis. It would be useful to maintain fly-free corridors through such belts of infested woodland, if only for limited periods, and this was the subject of the trials described in this paper.

The cattle route chosen, from Sukumaland, south of Lake Victoria, is used by thousands of cattle being driven to slaughter in N. Tanganyika and Kenya. (Trypanosomiasis is not important in cattle about to be slaughtered, but this stock route resembled those between grazing lands mentioned earlier, and therefore made a suitable area for study.) An area 4 by 2 miles along the cattle route was marked out for treatment. It formed the northern part of a belt of woodland containing *G. swynnertoni* and was mainly covered with light deciduous scrub with many open grassy clearings. The country was undulating and intersected by ridges and ravines. The treatments consisted of spraying of 5 per cent. DDT in dieselene at the rate of 0·5 gallon per acre, from aircraft flying at 120 m.p.h. Seven treatments were given at fortnightly intervals. A height-wind product of 2,000 (ft. × m.p.h.) was aimed at, with a swathe width of 88 ft. The methods of maintaining accuracy of spraying sorties are described. At first, spraying was only done in early morning and late afternoon, to avoid atmospheric turbulence; but progress was slow, even when two aircraft were used, and a complete treatment took 6 days. Since the residual value was very doubtful, it was considered that the tsetse might avoid the spray in these circumstances. For the later application, therefore, spraying continued all day.

Physical and chemical determinations were made of the spray cloud and ground deposit. The MMD of the spray was approximately 0·35 mm. and

the ground recovery about 60 per cent. (This figure exceeded the peak recovery from a single swathe, but was built up by overlapping of successive swathes.) Sampling at different points gave very great individual variation, not associated with swathe bands, but apparently due to vagaries of the atmosphere.

Biologically, the effects were judged by weekly fly rounds along the central cattle route and along 4 other paths, roughly parallel, but nearer the periphery. The figures for non-teneral males before treatment were (approx.) 50 on the cattle route and 14 to 23 on the other paths. The figures after spraying indicated a 70 per cent. kill by each treatment, but the final decrease in numbers of flies was greater than would be expected. In the first month the figures ranged from 18 to 65 per cent. of the pre-treatment counts; by the third month they were 0 to 32 per cent.; and for 2 months after treatment the area was virtually free from flies. Subsequently, the fly numbers rose again, fairly rapidly. This degree of success suggests that the flies do not breed in the treated area, which is probably stocked by fly immigration, and this was probably low during the trial. *J. R. Busvine*

KEPPIE, Audrey A. N. **Modified Course of *T. congolense* Infection in Mice given Diets with Milk Casein.** *Brit. Med. J.* 1953, Oct. 17, 853–7.

The author has found that mice which had been fed on a diet containing different amounts of milk casein as protein, when infected with a virulent strain of *T. congolense*, failed to show parasites in the peripheral blood. She notes the analogy with the results obtained by MAEGRAITH *et al.* [this *Bulletin*, 1953, v. 50, 384], who observed that rats infected by blood inoculation with *P. berghei* and maintained on a milk diet were able to suppress or radically cure the infection. The present author has tested in all 5 different diets. Diet 1 consisted of cubes of natural foods giving good growth and breeding performance; diets 2, 3 and 4 contained 30, 20 and 10 per cent. of casein respectively and diet 5 was of bread soaked in milk and occasionally included oats. The full composition of these diets is given in a table; and in all cases the mice gained weight. The infection normally ends fatally either in the acute or chronic phase of infection. Mice given diets 1 and 5, which are more complex than the others which contain larger amounts of casein, developed a more intense parasitaemia, and the rise in the number of parasites was more rapid. In diets 2, 3 and 4 with a milk casein source of protein, parasitaemia was less intense or infection did not occur. The author concludes as follows:—

"Since one of the two 'normal' diets contained milk but permitted normal development of the infection it might appear that failure of the incomplete diets to nourish the parasite is the explanation of the observed results, rather than that milk itself contains an antiparasitic agent." [See also MACKERRAS, p. 21, above, who used *T. lewisi*.] *J. D. Fulton*

FRIEBEL, H. Über die Trypanosomeninfektion der Maus als biologische Arbeitsmethode. [**Infection of Mice with Trypanosomes as a Biological Procedure**] *Arch. f. Exper. Path. u. Pharm.* 1952, v. 216, No. 6, 501–5, 3 figs.

——. Über den Einfluss des Cortisons auf die Phagocytoseleistung der Makrophagen. [**The Effect of Cortisone on the Phagocytic Power of Macrophages**] *Arch. f. Exper. Path. u. Pharm.* 1952, v. 216, No. 6, 506–14, 3 figs. [36 refs.]

Friebel, H. Über den Einfluss von Cortison auf die Infektabwehr. (Versuche an trypanosomenkranken Mäusen.) [**The Effect of Cortisone on Defence Mechanism in Mice with Trypanosome Infections**] *Arch. f. Exper. Path. u. Pharm.* 1952, v. 216, No. 6, 515–35, 11 figs. [24 refs.]

——. Über den Einfluss des Cortisons auf die Behandlung der experimentellen Trypanosomeninfektion mit Trypanblau. [**The Effect of Cortisone on the Treatment with Trypan Blue of Experimental Trypanosome Infections**] *Arch. f. Exper. Path. u. Pharm.* 1952, v. 216, No. 6, 536–40, 3 figs.

Zeledón, R. & Mena, C. Primer caso de enfermedad de Chagas de la Provincia de Alajuela. [**First Case of Chagas's Disease in the Province of Alajuela, Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1953, July, v. 1, No. 1, 55–62, 2 figs.

Trejos, A. & Montero-Gei, F. Estudios sobre tripanosómidos de Edentata en Costa Rica. I. *Trypanosoma legeri* en *Bradypus griseus*. [**Studies on Trypanosomes in Edentates in Costa Rica. I.** *Trypanosoma legeri* **in** *Bradypus griseus*] *Rev. Biologia Trop.* San José, Costa Rica. 1953, July, v. 1, No. 1, 21–7, 4 figs.

Manso Soto, A. E., Bejarano, J. F. R., Loretti, G. A., Rispoli, J. A. & Schettini, M. Resultado de una investigación sobre enfermedad de Chagas en las provincias de Entre Ríos y Corrientes. [**Investigation into the Prevalence of Chagas's Disease in Entre Rios and Corrientes**] *Universidad Buenos Aires: Mision de Estudios de Patologia Regional Argentina. Publicaciones Nos. 81/82.* 1952, v. 23, 33–42, 1 map. [18 refs.]

The presence, even the widespread diffusion, of Chagas's disease in the Provinces of Corrientes and Entre Rios has been suspected for some years and the investigation, the results of which are recorded here, has confirmed this. The authors have examined by complement fixation 275 sera, the blood being taken from those living in suburbs of towns, villages, hamlets and isolated places on the eastern borders of the Provinces mentioned. Their dwellings were found to be infested by Triatomidae and all the patients said they had been bitten at various times by them. All but 18 of the 275 had been born in the Provinces and remained there. Some paid an occasional visit for a few days to the town of Buenos Aires, one had been to Itaquí and one to São Borja, in Rio Grande del Sul. Fourteen of the others had been born elsewhere but had lived for a long time in these Provinces or in Paraguay, Brazil or Uruguay. Four sera were anticomplementary.

Of the 257 who may be regarded as autochthonous, 51 gave strong positive reactions, 10 weak positive and 1 doubtful. Twenty-one of those giving a strong positive had never been out of the locality where they were born and 12 had never left the zone studied; of the 10 weak positive 3 had never left their birthplace and 3 had always lived in the district. The detailed results are shown in 2 tables which give the locality, the age, sex, the previous illnesses and the serum results. *H. Harold Scott*

Guedes, A. da S. Determinação do índice de infecção de triatomíneos por *Schizotrypanum cruzi* pelo exame simples de fezes obtidas por expressão e por dissecção do intestino posterior do inseto. Dados comparativos preliminares. [**Determination of the Index of Infection of Triatomid Bugs with** *T. cruzi*, **by Examination of Faeces and by Dissection of Hind Gut: Comparative Figures**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 433–6. English summary.

The author examined rather over 2,000 triatomids in the State of Minas Gerais, about two-thirds of them adult and the rest large nymphs. About 90 per cent. were *Triatoma infestans* and the remainder *Panstrongylus*

megistus: it is unfortunate that the author does not distinguish these two in presenting his data. Adults were infected with *T. cruzi* in 60 per cent., nymphs in 22 per cent. of individuals. Examination of faeces showed 47 per cent. infection in the bugs of all ages and both species. When those which had not been found positive were dissected, the organism was found in the hind gut of 8·5 per cent. *P. A. Buxton*

Geigy, R., Halff, L. A. & Kocher, V. Untersuchungen über die physiologischen Beziehungen zwischen einem Überträger der Chagas-Krankheit *Triatoma infestans* und dessen Darmsymbionten. [**Studies on the Physiological Relationship Between** *Triatoma infestans* **and a Symbiont in its Gut**] *Schweiz. med. Woch.* 1953, Sept. 26, v. 83, No. 39, 928–30, 6 figs.

A Gram-positive, ovoid, coccoid bacterium is reported as a symbiont in the gut of *Triatoma infestans*. Its bacterial characteristics have been investigated but its identity remains uncertain although in some ways it resembles *Streptococcus viridans*. In the bug it occurs between the epithelial cells and in the lumen of the anterior part of the midgut and, after a blood-meal, in the blood mass and in the faeces. It is presumed to pass from parent bugs to offspring by contaminating the mouthparts of the larvae after they have hatched from the eggs. This bacterium, like the actinomyces of *Rhodnius prolixus*, is essential for the successful post-embryonic development of *T. infestans*. In its absence, few individuals reach the adult stage and those which do take 2 or 3 months longer than infected controls; some may still show nymphal features after the final moult. The needs and production of vitamins by the organism show that it produces folic acid far in excess of its own requirements. It is supposed that excess folic acid produced by the organism in the bug provides the constituent essential for the successful post-embryonic development of the bug to the adult stage. Experiments in progress, in which sterile bugs are exposed to filtrates of the bacterium, or are fed on folic acid through membranes, may provide further evidence to support this view. The figures are photographs of the bacterium in the sectioned gut of the bug and in culture, and of normal and abnormal bugs. *D. S. Bertram*

Escobedo, A. R. & Mazzotti, L. Estudios sobre *Triatoma picturata*, Usinger en relación con su aptitud para transmitir *Trypanosoma cruzi*. [**Studies on the Aptitude of** *T. picturata* **to transmit** *T. cruzi*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Mar., v. 13, No. 1, 23–5. English summary (6 lines).

Infection with *T. cruzi* commonly results from contamination of the mucosa, or of the excoriated skin, by infected faeces of the various triatomid vectors.

The authors fed 165 hungry *Triatoma picturata* in batches of 4, and observed the length of time between the end of the feed and the first defaecation; 16·4 per cent. defaecated within 1 minute, the remainder did so first at various intervals up to 1 hour (except 9 which failed to perform within 90 minutes). It seems that an infected bug would be likely to transmit *T. cruzi* if it defaecated within a minute of feeding, because it would probably do so near the site of the bite, which could thus become contaminated, but the length of time spent by the bugs in feeding was 8–59 minutes (average 16) and during this period a sleeping person might crush a replete bug on his skin and become infected in that way through the puncture made by the bug while feeding.

It seems, therefore, that *T. picturata*, though not showing the same aptitude for infecting man as some of the notorious vectors, is nevertheless quite capable of doing so. *Charles Wilcocks*

Bettinotti, C. M., Nores, M. A. & Restanio, J. A. La prueba de fijación de complemento en el diagnóstico de casos inaparentes de enfermedad de Chagas. Comunicación previa. [**Fixation of Complement in the Diagnosis of Inapparent Chagas's Disease**] *Semana Méd.* 1953, Aug. 13, v. 103, No. 7, 196–200, 1 fig. [14 refs.]

Dr. Bettinotti, one of the authors of this article, had reported 160 positive among 493 (32·45 per cent.) sera examined by complement fixation in Córdoba from suspected patients, including those with cardiac affections, and Neghme examined chance samples in endemic zones in Chile and found among 14,408 that 12 per cent. were positive by xenodiagnosis, while among 10,660 examined by complement fixation 14·25 per cent. were positive.

The present article is a preliminary communication on specimens sent to the Hygiene Centre in Córdoba, but excluding those from the Cardiological Institute and any sent in especially for diagnosis of suspected Chagas's disease; in other words specimens from the general population showing no special indications of infection by *T. cruzi*. Davis's method, with cultures of *T. cruzi* as antigen, was used.

Altogether 170 such specimens were subjected to test; 33 (19·4 per cent.) gave a strong positive and 13 others a weak positive, together 46 (27 per cent.). In the Province of Córdoba itself 129 sera were examined from 21 districts; 24 were strongly positive (18·6) and 6 weakly positive, together 30 (23·2); in the town of Córdoba (population 370,000), of 72 tested 10 were strongly and 2 weakly positive. In the Province of Catamarca of 24 tested, 10 were positive, 6 strong and 4 weak; in the Provinces of La Rioja and Del Estero the numbers tested were only 10 and 1 respectively; the former had 3 strong and 2 weak positives, the latter 1 weak positive.

These results indicate greater degrees of infection than do the other diagnostic methods—thick drop, xenodiagnosis, inoculation, etc. This is only to be expected as many chronic cases yield negative results to these other methods. Measures to be undertaken should include destruction of Triatomidae and careful examination of blood-donors, tests for inapparent *T. cruzi* infection being made as well as the usual tests for syphilis, malaria and the common infections. [See also this *Bulletin*, 1949, v. 46, 813, 1128; 1950, v. 47, 123; 1952, v. 49, 678; 1953, v. 50, 493 *ter.*, 693.] *H. Harold Scott*

Hack, W. H. & Romaña, A. F. Estudio comparativo de la acción de algunos insecticidas sobre *Triatoma infestans*. [**Comparative Study of the Action of Different Insecticides on** *Triatoma infestans*] *An. Inst. Med. Regional.* Tucuman, Argentina. 1953, June, v. 3, No. 3, 277–82. English summary.

Laboratory experiments on the effectiveness of DDT, BHC, aldrin and dieldrin against *Triatoma infestans* were made by exposing 10 bugs in small containers to contact with, or the vapour effect of, each of the compounds. The dosage for each substance was at the rate of 1 gm. of active insecticide per sq. metre. *Gamma* BHC was the most effective, killing all bugs within 24 hours both by contact and by vapour alone. A slower action was obtained with aldrin and dieldrin; DDT was very unsatisfactory.

Bugs exposed to sublethal doses of these insecticides succeeded in moulting and feeding several days after contact with the insecticide.

D. S. Bertram

Manso Soto, A. E. & Lopetegui, R. Derivados del furano como tripanosomicidas. Acción del 5-nitrofurfural-diacético, en la infección experimental en Laucha, con Tripanosoma cruzi. [**Furan Derivatives as Trypanosomicides. Action of 5-nitrofurfural diacetate in Mice**] *Universidad Buenos Aires: Mision de Estudios de Patologia Regional Argentina. Publicaciones Nos. 81/82.* 1952, v. 23, 43–5.

A specific for the treatment of Chagas's disease has long been looked for and many drugs have been tried without attaining this end and the compound mentioned in this paper must join the majority. The semicarbazone of 5-nitrofuraldehyde, Furacin, had proved very active against many bacteria, Gram-positive and Gram-negative, *in vivo* in mice and *in vitro* against the organisms themselves. It was observed also that furan derivatives had shown a certain degree of lethal activity against trypanosomes in mice infected with *T. equiperdum*. The authors, therefore, thought it worth while to make trial of this compound, nitrofurfural diacetate, in experimental infection of mice with *T. cruzi*. They used mice of 20 gm. weight, fed them on cheese and maize-flour, varying the proportions to see whether the amount of fat had any effect on the toxicity of the drug.

A single dose of 10 mgm. caused death in less than 24 hours; 5 mgm. was better tolerated but nevertheless killed all the animals in less than 3 days with symptoms of excitability of the central nervous system, dyspnoea, convulsions and syncope. Finally, it was found that mice of 20 gm. weight and about 1 month old tolerated well a daily dose of 3·7 mgm. for, at all events, 3 weeks without any toxic symptoms. Thirty-two mice were inoculated intraperitoneally with a culture of *T. cruzi* and 24 had trypanosomes in their peripheral blood in 15–25 days. Eight were kept as controls; 16 were given the drug, 3·7 mgm. daily for 3 weeks, starting 20 days after the inoculation. Examinations were carried out at intervals for 10 weeks, but no difference was found between those given the drug and the controls, the trypanosomes continued to survive and were seen in the peripheral circulation to the last.

H. Harold Scott

LEISHMANIASIS

i. Latyshev, N. I., Kryukova, A. P. & Povalishina, T. P. [**Essays on the Regional Parasitology of Middle Asia. I. Leishmaniases in Tadjikistan. —Materials for the Medical Geography of Tadjik S.S.R.** (Results of Expeditions in 1945–1947)] *Problems of Regional, General & Exper. Parasit. & Med. Zool.* Moscow. 1951, v. 7, 35–62, 13 figs. [19 refs.] [In Russian.]

ii. ——, Shoshina, M. A. & Polyakov, A. Y. [**II. Visceral and Cutaneous Leishmaniasis in the Town Osh (Kirgizia)**] *Ibid.*, 63–9, 2 figs. [In Russian.]

iii. Kryukova, A. P. [**The Flagellate Parasites of** *Phlebotomus arpaklensis*] *Ibid.*, 70–73, 2 figs. [In Russian.]

The two parts of the *Essays on the Regional Parasitology of Middle Asia* —together with the third paper—provide further important contributions by

Russian workers to the epidemiology of leishmaniases in the subtropical regions of the Soviet Union. A critical review of earlier Russian work on this subject appeared in this *Bulletin*, 1944, v. 41, 331.

(i) The first paper deals with Tadjikistan, a mountainous country with densely populated valleys, where visceral leishmaniasis is prevalent in Fergana, but until recently has not been recorded from southern Tadjikistan. However, since 1933 sporadic cases and outbreaks of this disease began to appear there in increasing numbers among workmen engaged in the reclamation of the Vakhsh valley. In the course of a survey carried out by the authors in 1945 it was established that the disease was autochthonous in this area, while outbreaks among persons settling down on previously uninhabited land indicated that the infection had a natural local focus. A study of the local fauna seemed to point to jackals as possible reservoirs of the human infection, and in 1946 the correctness of this suspicion was confirmed by the discovery of spontaneous visceral leishmaniasis among these animals [presumably *Canis* (*Thos*) *aureus*, the common jackal in central Asia and in the Caucasus].

It would appear that enzootic foci of the disease have always been present in the Vakhsh valley, and when human beings first came in contact with the jackals they acquired the infection from these animals. But later the replacement of temporary settlements by modern villages, surrounded by cultivated land, brought about a bonification which forced the jackals to retreat into the open country, with the result that the epidemiological chain was ruptured and the outbreaks came to an end. The discovery of spontaneous infection in jackals probably explains the peculiar features of human visceral leishmaniasis in the rural districts of Middle Asia and Transcaucasia, where the area of its distribution is extensive but the incidence of infection is low, thus reflecting the wide distribution of jackals and their slight contact with man. Under these conditions the disease is therefore a typical zoönosis.

The epidemiological situation in the densely populated towns of Middle Asia (Tashkent, Samarkand, Bokhara, Fergana, Kokand) and Transcaucasia (Erevan, Tiflis) is quite different, for in these ancient cities visceral leishmaniasis had long ago adapted itself to man as the principal host, while retaining its infectivity for dogs, whose ancestors must have originally acquired the infection from their wild congeners, the jackals.

One of the peculiarities of the disease in rural districts of Middle Asia is the high incidence of infection among adults (about 50 per cent.), whereas in urban districts it is of the Mediterranean type, with the highest incidence among children (95 per cent.). The authors suggest that the difference between the age-groups affected in rural and urban areas might be due to the existence of clinical variants of the disease, correlated with differences in the epidemiological conditions in the 2 habitats. [However, it is conceivable that the high incidence among adults in rural areas might be due to the fact that, being newcomers and not having previously been exposed, they were more susceptible to the infection than the indigenous population of the towns, where children are the chief sufferers. This view finds support in cases of kala azar among British and American troops operating in the Mediterranean area during the last war.]

The authors then turn to a consideration of cutaneous leishmaniasis, represented in Middle Asia by 2 variants—the early ulcerating ("moist") rural or desert form, and the late ulcerating ("dry") urban form [see this *Bulletin*, *loc. cit.*]. In Tadjikistan the rural form is prevalent along the southern borders of the republic, while the urban form is found in the north.

leaving the central area free. The rural form is a zoönosis, the reservoir hosts of which in this region are the gerbils *Pallasiomys erythrourus* and *P. meridianus*, from which the infection is transmitted to man by sandflies breeding in their burrows, the most important vectors being *Phlebotomus caucasicus*, *P. papatasi* and *P. arpaklensis* (see (iii) below). The authors distinguish 3 types of foci of cutaneous leishmaniasis, differing in the degree of contact with the reservoir hosts. The first type is in small settlements surrounded by the desert, inhabited by gerbils, which represent a permanent source of human infection. Here the disease is hyperendemic, with a high incidence (80–100 per cent.). The second type is prevalent in undeveloped settlements, into which the gerbils have penetrated, establishing themselves in proximity with human dwellings. Here the disease is endemic, with a fairly high incidence (up to 50 per cent.). Lastly, the third type is represented by large flourishing oases, from which agricultural development has forced the gerbils to retreat, with the result that these settlements are practically free of infection, except along the periphery adjoining the open desert, where the incidence does not exceed 2–3 per cent.

As regards the urban type of cutaneous leishmaniasis in Northern Tadjikistan, its incidence varies from place to place. Its vectors are *Phlebotomus papatasi*, *P. sergenti*, *P. caucasicus* and *P. chinensis*.

In the course of this survey the authors also visited some mountain foci of oriental sore. One of these is Kalai-Khumba (altitude 1,340 m.), where children are chiefly affected, the sores usually being multiple and restricted to the face, while infected animals are absent. The main local vectors are *P. sergenti*, with *P. caucasicus* in the second place. Similar foci are known in the Caucasus, *e.g.*, in Zanzegur (1,500 m.) and in the Dagestan mountains, where sandflies of the *major* group are prevalent. A common feature of all the mountain foci is their isolated position, which seems to indicate that they represent relicts, which had become separated from the vast area of distribution of cutaneous leishmaniasis extending through southern Eurasia and northern Africa.

(ii) In a brief review of the distribution of visceral leishmaniasis, the authors point out that the extreme eastern points within the Territory of U.S.S.R. are Ili (43.51N., 77.11E.) and Alma-Ata (43.16N., 76.56E.) in Kazakhstan, Frunze (42.54N., 74.35E.) and Osh (40.32N., 72.48E.) in Kirgizia, and Kulyab [37.59N., 69.41E.] in Tadjikistan. Moreover, Ili is also the northernmost point hitherto recorded for kala azar in the whole Eastern hemisphere.

In the town Osh, to which this paper is devoted, both visceral and cutaneous leishmaniases are present. A survey of the sandfly population carried out in human dwellings in 1947, revealed the following species: *Phlebotomus papatasi*, *P. caucasicus*, *P. sergenti*, *P. chinensis* and *P. minutus*. In view of the occurrence in the vicinity of the town of gerbils (*Pallasiomys erythrourus* and *Meriones tamaricinus*), they were also included in the survey, but these animals proved to be free of infection, and no sandflies were found in their burrows. On account of this, the source of human oriental sore in the town remains unsolved. As regards kala azar, it is suspected that the numerous foxes found in the outskirts of the town might serve as reservoir hosts.

In conclusion, the authors discuss the relations between the different forms of visceral leishmaniasis in Asia. It is recalled that, although India is contiguous with China and Middle Asia, it is characterized by a special type of kala azar, whereas in both last-named regions, in spite of their separation by wide spaces, the disease is of the Mediterranean type. The

peculiarities of Indian kala azar are attributed to the early formation of mountain barriers isolating India from the Chinese and Middle Asian regions, the separation of which from each other and from the Transcaucasian and Mediterranean endemic areas took place much later. However, even this recent isolation was sufficient to enable the parasites in different localities to adapt themselves to transmission by distinct species of sandflies: *P. chinensis* in China, those of the *sergenti* group in Middle Asia, and *P. perniciosus tobbi* in Transcaucasia.

(iii) The discovery in south-eastern Tadjikistan of a high proportion of *Phlebotomus arpaklensis* in the burrows of gerbils (*Pallasiomys erythrourus* and *P. meridianus*) near the village Ayvadzh, which is an old-established endemic focus of the rural type of cutaneous leishmaniasis (see (i) above), induced the author to investigate the possible rôle of this sandfly in the transmission of the infection. It was found that up to 6·4 per cent. of these insects harboured leptomonad flagellates, which were of two types: one, having a long narrow body with a long flagellum, was indistinguishable from the culture forms of *Leishmania tropica*, while the other, having a stumpy body with a short flagellum, resembled the leptomonad forms cultivated from the blood of geckos. Further light on the nature of the two flagellates was thrown by experimental infections. In one experiment 3 out of 30 starved female flies, which were allowed to feed on geckos, developed an infection with the reptilian flagellate, while one had a mixed infection with the 2 forms. In another experiment, mice were inoculated intraperitoneally with the sandfly flagellates: none of those inoculated with the reptilian forms became infected, but those inoculated with *L. tropica* developed a generalized infection, which terminated fatally in 3–4 weeks. It was also demonstrated that *Phlebotomus arpaklensis* readily attacked human beings.

It was previously thought that sandflies of the *minutus* group did not transmit human leishmaniasis, but the above experiments and the close association of *P. arpaklensis* with the reservoir hosts of oriental sore indicate that it should be regarded as a vector of this disease. *C. A. Hoare*

Tarizzo, M. L., Bracken, H. A. & Strait, D. J. **A Case of Visceral Leishmaniasis in Saudi Arabia.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 846–9.

"A report is given of a case of visceral leishmaniasis diagnosed and treated in Dhahran Hospital, northeastern Saudi Arabia, the first autochthonous case from Saudi Arabia to be reported in medical literature."

Sen Gupta, P. C., Bhattacharjee, B. & Ray, H. N. **The Cytology of *Leishmania donovani* (Laveran & Mesnil, 1903) Ross, 1903.** *J. Indian Med. Ass.* 1953, May, v. 22, No. 8, 305–8, 31 figs. on 2 pls.

The newer histochemical techniques were employed to elucidate the cytology of *Leishmania donovani*, seen in (a) smears of spleen or bone-marrow, (b) sections from cases of kala azar or post-kala-azar dermal leishmaniasis, and (c) cultures on NNN medium. Schaudinn's fixative was usually employed for smears (preceded by osmic acid vapour for 2 minutes for leptomonad forms) and Zenker's for tissues. Material was then treated by the Feulgen method (8–10 minutes' hydrolysis in N HCl at 60°C. was found satisfactory though it caused some shrinkage of flagellate forms in

smears), by exposure to ribonuclease, by supravital staining with Janus green and neutral red, and by the usual techniques.

The nucleus in both leishmanial and leptomonad forms was Feulgen-positive and was seen to be vesicular in type with the chromatin distributed around the nuclear membrane plus a small central karyosome. Particularly after treatment with ribonuclease, the chromatin appeared to occur in the form of fine dots, usually 6 in number and these were thought to be chromosomes. The kinetoplast consisted of (a) flagellar vacuole, (b) parabasal body (Feulgen-positive in both forms of the organism), (c) rhizoplast, and (d) blepharoplast. The presence of deoxyribonucleic acid in the kinetoplast indicates that this structure is of nuclear type, and because it controls movement of the organism, it might well be called the kinetonucleus. Ribonuclease had a powerful action on the cytoplasm of leptomonads—basophilia and volutin granules disappeared—so it is assumed that these components contain ribonucleic acid. Supravital staining demonstrated the presence of mitochondria and neutral red vacuoles. *P. C. C. Garnham*

Sen Gupta, P. C., Sanyal, N. N., Bhattacharyya, B. & Mathen, K. K. **Avitaminosis in Kala-Azar. Preliminary Observations.** *Indian Med. Gaz.* 1952, Oct., v. 87, No. 10, 444–8.

Patients with kala azar are often emaciated and also have stigmata of specific vitamin deficiencies.

A study of the nutritional status of a series of 136 kala-azar patients was carried out in the out-patient department of the Calcutta School of Tropical Medicine. Clinical criteria only were recorded. The patients were unselected, and 40 controls were taken from among the patients' friends and relatives who attended with them. Most of the patients were in a well-developed stage of the disease. The diagnoses were made by the aldehyde test and the complement-fixation test.

The stigmata observed included xerosis and discolouration of the conjunctivae, night-blindness, spongy gums, flabbiness, redness and rawness of the tongue, angular stomatitis, scantiness, dryness and discolouration of the hair, dryness and roughness of the skin, oedema, and purpura. Observations were also made on the heart, lungs, bowel movements, deep reflexes and sensations, including burning feet. The results were assessed statistically and the differences between the patients and the controls with reference to the eye, tongue, gums, hair and skin were all found to be significant, with the exception of the discolouration of the conjunctivae.

The observations indicated deficiencies in vitamins A, B complex and C, and biotin and para-amino-benzoic acid, but not of vitamin D.

In most cases the " significances " were considerable, the value of " t " was from 2·0525 to 12·4428.

In discussing the causes of these stigmata of avitaminosis, the authors suggest that liver dysfunction is probably the cause of the vitamin-A deficiency and to some extent that of vitamin B: the latter deficiency may also be caused by the febrile nature of the disease increasing B_2-complex requirements and also by the fact that B_2 may be utilized in excess by the parasite. Vitamin-C deficiency they consider may also be due to the latter cause to some extent, but mainly to impairment of adrenocortical function which is known to occur in kala azar. [This is an interesting line of work which is worth following, but there are too many fallacies for any conclusion to be based on the present investigation. Firstly, the basic premise, namely that the stigmata of specific food deficiencies can only be caused by

the actual or conditional deficiency of that particular substance, is surely not established. Secondly, kala azar is a febrile disease and the tradition to starve a fever is strong in India; the authors discuss this possibility but dismiss it, in the reviewer's opinion, too readily. Thirdly, the controls are of entirely different age groups; only 2 controls were under 16 years, whereas more than half the kala-azar patients were under this age. Finally, it might be argued that malnutrition was a contributory cause to the establishment of the infection.] *L. E. Napier*

Ho, E. A., Tao, C. Y. & Sung, S. J. **Evaluation of Sodium Antimony Gluconate in Mass Treatment of Kala-Azar by the Rate of Disappearance of Leishman-Donovan Bodies.** *Chinese Med. J.* Peking. 1952, May–June, v. 70, Nos. 5/6, 245–52. [12 refs.]

Sodium antimony gluconate was first used in the treatment of kala azar in China in 1937; good results were claimed. The present enquiry is an attempt to assess the value of 3 [presumably proprietary] preparations of this antimonial by making periodic sternal punctures on the patients during the course of treatment. [Although in the " screening " of specifics with animals this procedure may be of value, it is a poor criterion of cure in man, unless the time factor is taken into consideration; at the conclusion of an effective concentrated course of treatment parasites are often present.]

The drugs were Sticon, Glucotan and Solustisin. The subjects were 127 patients with proven kala azar, aged between 1 and 29 years (with 4 exceptions). The individual doses given were 33·3 mgm. of Sb_5 (or 0·33 ml. of solution) per kgm. body-weight, but were reduced to 2/3rd in adults over 40 kgm. In 22 patients [shown as 20 in a table] a reduced dosage was adopted, 25·0 mgm. per kgm. The drug was given intravenously, with few exceptions, twice a week and after a negative sternal puncture 2 more injections were given. The total number of injections is not indicated, but some patients appear to have received 11.

There were no significant differences between the results obtained with the 3 different drugs, or the 2 different dosages. A total of 117 completed the course of treatment, of the remaining 10 one was known to have died. In only 4 cases was the sternal puncture negative between the second and third injection, but in 96 cases (82 per cent.) it was negative between the fourth and fifth injection, and in all but 3 cases between the sixth and seventh. In these 3 it was negative between the eighth and eleventh injections. In a follow-up, 11 months after the last course of treatment was completed, all the patients were well.

The by-effects of treatment were not serious and were infrequent except for nose-bleeding which occurred in 38 cases and cough which occurred in 14, of which 9 were in the Solustisin series.

The results were compared with those of a series of patients treated by urea stibamine [this *Bulletin*, 1949, v. 46, 815]. The results with sodium antimony gluconate were significantly better. The dosage according to Sb_5 content was, however, 6 times as great in the latter series. If toxicity is taken as the criterion the dosage of the 2 drugs was about equal, 1/60 and 1/80 LD50. *L. E. Napier*

Margarot, J., Rimbaud, P., Izarn, P. & Rioux, J. A. Deux nouveaux cas de bouton d'Orient autochtone. [**Two New Autochthonous Cases of Oriental Sore in Southern France**] *Montpellier Méd.* 1953, July, v. 44, No. 1, 34–7, 2 figs.

Biagi F., F. Síntesis de 70 historias clínicas de leishmaniasis tegumentaria de México (úlcera de los chicleros). [**Study of 70 Cases of Cutaneous Leishmaniasis (Chicle Ulcer) in Mexico**] *Medicina*. Mexico. 1953, Aug. 25, v. 33, No. 682, 385–96, 1 map & 12 figs.

Most of the infections here referred to occurred in the State of Campeche, among those whose occupation was the collection of chicle gum, an important basis of chewing gum. Among the 70, males greatly preponderated, 66 to 4 females, but this is ascribed to the fewer women exposed to infection, to their being exposed for a shorter time and to the fact that " sub-clinical " cases are numerous among them. Even the very young do not escape; one was only 7 years old, 3 were 10 years old and 77·7 per cent. were below 30 years. More than half the patients presented ulcerating subcutaneous nodules, starting as itching papules; others show vegetating ulcers; the ears are the commonest sites and by cicatrization and ulceration much deformity may result. The vector is *Phlebotomus*. Leishmania are few in the lesions, but the Montenegro reaction is always positive.

H. Harold Scott

FEVERS OF THE TYPHUS GROUP

Fuller, H. S. **Studies on Human Body Lice,** *Pediculus humanus corporis*. **II. Quantitative Comparisons of the Susceptibility of Human Body Lice and Cotton Rats to Experimental Infection with Epidemic Typhus Rickettsiae.** *Amer. J. Hyg.* 1953, Sept., v. 58, No. 2, 188–206. [24 refs.]

The purpose of this investigation was to study the responses of human body lice to infection with measured doses of *Rickettsia prowazeki* with a view to finding whether the lice would be more sensitive than cotton rats for the detection of very small numbers of the rickettsiae.

The lice were fed once on infected suspensions by the chick-skin membrane method of Fuller *et al.* [see this *Bulletin*, 1950, v. 47, 127] and then were kept in constant conditions of temperature and humidity and were fed once daily on normal rabbits. After suitable periods stained smears of the intestines of the lice were examined for rickettsiae and in some cases suspensions of the lice were inoculated into cotton rats.

The louse-feeding test of infectivity gave much the same results as the standard method of inoculating cotton rats when the same measured doses of rickettsiae were employed, but the technical difficulties connected with rearing, feeding and examining the lice were found to be serious drawbacks which rendered the method unsuitable for routine purposes. The author points out, however, that in view of the responses of the lice to measured doses of *R. prowazeki* " these insects offer outstanding possibilities as tools in basic studies of rickettsiae and certain other infectious agents ".

John W. D. Megaw

See also p. 18, Owens, Programas cooperativos de control de insectos en Centro América. [**Cooperative Insect-Control Programmes in Central America**]

Audy, J. R. **Trombiculid Mites infesting Bats in Malaya, with Descriptions of Three New Species.** Reprinted from *Bull. Raffles Museum.* Singapore. 1952, Aug., No. 24, 132–59, 6 figs. [10 refs.]

The author describes 3 new species of Trombiculid mites, *Trombicula (?Neotrombicula) dimolinae*, *Trombicula revelae* and *Schöngastiella hipposideros*, parasitic on bats in Malaya. The types of the first are deposited in the British Museum (Natural History), the Raffles Museum, South Australian Museum and the U.S. National Museum; those of the second and third are in the Selangor Museum and the British Museum (Natural History), respectively. Supplementary descriptions of 6 other species infesting bats in this region, and a key to the species of *Trombicula* parasitic on bats in the Oriental and Australasian regions, are also given. The author points out that the Trombiculidae of bats are of particular interest as some of them are closely related to *Trombicula akamushi*, the vector of scrub typhus in South-East Asia, and have been recorded from Europe, North America and probably Africa.

Host records are given of 16 species of bat chiggers from the Oriental and Australasian regions, 5 species from Europe, 5 species from Africa and 7 species from the Americas. In addition, 6 species collected from bat-guano in caves and which by inference may be parasitic on bats, are also mentioned. During the course of the present study, 682 bats were examined belonging to 5 different families: the Pteropodidae, Emballonuridae, Rhinolophidae, Vespertilionidae, and Molossidae; the last 2 families were free of Trombiculid larvae. The host records show that bat chiggers are not particularly rich in species and, compared with the other mammals, bats are not so frequently infested. The author points out that this might probably be due to the relatively slight direct contact between bats and the breeding places of the mites; on the other hand, birds which have a close contact with their nests and the ground are more frequently infested.

In his notes on the chaetotaxy of Trombiculid larvae, the author remarks that the specialized leg setae of leg III are helpful in differentiating closely related species. As the body setae are of taxonomic importance, it is suggested that specific descriptions should include their number and descriptions as well as a comparison of the different types.

M. G. R. Varma

Price, W. H. **The Epidemiology of Rocky Mountain Spotted Fever. I. The Characterization of Strain Virulence of** *Rickettsia rickettsii*. *Amer. J. Hyg.* 1953, Sept., v. 58, No. 2, 248–68, 1 fig. [22 refs.]

The author has already published 2 important papers on the difficult problem of virulence of rickettsiae [see this *Bulletin*, 1953, v. 50, 615, 1035].

In the present paper he defines the term virulence as designating " the sum of the properties of the parasite which might be of importance in determining the severity of the infection with reference to a susceptible host species". Among these properties are:— invasiveness, the organ or tissue selected for multiplication, the rapidity of multiplication, the size of microbic population before growth becomes inhibited, and the production of substances injurious to the host cells.

The paper deals specially with some of the properties of *Rickettsia rickettsi* which may play a part in determining the virulence of the organism.

The technical details of the numerous experiments described cannot usefully be abstracted: they must be read in the original paper which will be found very interesting by workers engaged in research on the rickettsiae.

Four strains of *R. rickettsi*, having a wide range of virulence for guineapigs, were studied experimentally; the following findings are of general interest. The minimum number of *R. rickettsi* needed to infect guineapigs and to cause lethal infection of chick embryos is much the same for strains of high as for those of low virulence. Three strains of widely varying virulence were found to produce the same amounts of toxins and haemolysins when grown in chick embryos; they also had the same rate of multiplication and the same original distribution in the organs of inoculated guineapigs. Animals inoculated with the different strains produced complement-fixing and neutralizing antibodies at about the same time and at about the same titre. The virulence of a given strain for guineapigs is influenced by passage through different species of mammals. No differences were detected in the enzyme systems of a strain of high virulence as compared with a strain of low virulence. When very large numbers of rickettsiae of a less virulent strain were injected into guineapigs, 15 per cent. of the animals developed the same kinds of febrile and scrotal reactions as were produced in all the animals inoculated with the most virulent strains. Differences in the results were that the less virulent strains caused no deaths and the ultimate concentration of rickettsiae in the heart and brain was much less than in animals inoculated with virulent strains.

An incidental finding was that the pathogenesis of Rocky Mountain spotted fever was much the same in guineapigs irrespective of the route of inoculation — intraperitoneal, intravascular, or intramuscular.

John W. D. Megaw

Derrick, E. H., Berry, A. H., Tonge, J. I. & Brown, H. E. **Fevers of the Mackay District, Queensland.** *Med. J. Australia.* 1953, July 25, v. 2, No. 4, 121–9, 7 figs. [18 refs.]

This article is of special interest to medical men in Australia but it is also a good example of the solution of the general problem of differentiating the fevers of unknown origin in a given locality.

The Mackay district of Queensland is situated on the coast just inside the tropics; it is a fertile area with a rainfall of about 60 inches, most of which occurs during the hot and humid first quarter of the year. The land has been reclaimed from "tropical rain forest, commonly called 'scrub'" and from "open forest and tall grass"; it is enclosed on 3 sides by a range of hills and on the fourth side by the sea. In 1952 there were 125,000 acres of sugar cane and 200 dairy farms. Four of Mackay's companions, who first penetrated the area in 1860, were attacked by a fever lasting 3 or 4 weeks while camping by the main river, and one of the party died. This fever appears to have been scrub typhus.

The population of the area is now about 37,500, including about 15,000 inhabitants of the city of Mackay. Between 1900 and 1920 typhoid fever was common, but it is now unknown. Plague occurred in 1908 and 1909, causing 3 deaths. From 1915 onwards a problematic fever appeared in one locality; in 1922 it was reported that 53 cases with 10 deaths had been notified; most of the patients had been engaged in opening up new land. The usual diagnosis was typhoid fever, but serum tests were negative and retrospectively the disease is now thought to have been scrub typhus, though some of the cases "may perhaps have been tick typhus" which is known to occur in a mild form in north and south Queensland.

Recent serological tests have shown the occurrence in the district of the following fevers:—(1) two cases of scrub typhus in both of which the agglutination titre with *Proteus OXK* rose to 1–640, (2) two cases of murine

typhus in Mackay city with *P. OX19* titres of 1–320 and 1–160, (3) three cases of Q fever, and (4) six cases of leptospirosis of the *Leptospira pomona* type, confirmed by titres of 1–100 in 2 cases and 1–300 in 4. There have been occasional cases of fever in which agglutination tests against the above organisms, 5 other strains of the leptospira group, the typhoid group, and brucellosis have been negative. Most of these cases have been fairly mild, though one lasted 15 days and clinically resembled scrub typhus; 2 samples of serum, taken on the 28th and 38th days gave complement-fixation reactions for rickettsialpox at titres of 1–8 and 1–16; the significance of these reactions " is not clear ".

[In view of the close antigenic relationship between Rocky Mountain spotted fever and rickettsialpox, tick typhus may be a possible diagnosis.]

John W. D. Megaw

Cordier. La fièvre du Queensland. [**Q Fever**] *Maroc Méd.* 1953, June, v. 32, No. 337, 567–75, 2 figs. [39 refs.]

A useful review of the literature written in French [but Q did not originally indicate Queensland fever but Query fever].

Stoker, M. G. P. **Q Fever in Britain.** *Brit. Med. Bull.* 1953, v. 9, No. 3, 231–3. [30 refs.]

Jansen, J. Komt Q-fever in Nederland voor? [**Does Q Fever Occur in the Netherlands?**] *Tijdschr. v. Diergeneesk.* 1953, Oct. 1, v. 78, No. 19, 838–41.

The English summary appended to the paper is as follows:—

" In 62 cases of abortion and sterility in cattle free from brucellosis the complement fixation test for Q-fever was negative."

Salisbury, R. M. **" Q " Fever and its Human and Animal Associations.** *New Zealand Med. J.* 1953, Aug., v. 52, No. 290, 260–64. [24 refs.]

A goat which aborted while in a quarantine station in Somes Island, New Zealand, was found to be infected with *Coxiella* [*Rickettsia*] *burneti*. The goat had just been imported from a farm in Devon where a later test showed that some of the goats and cattle were infected with Q fever.

Smears from the placental tissues of the goat were examined by Sir MacFarlane Burnet and Dr. Derrick who found organisms whose appearance was consistent with the presence of a heavy infection with *R. burneti*. Serum of the goat gave a positive agglutination reaction with the rickettsiae of Q fever at a titre of 1:100. The goat was destroyed and 2 other goats and 4 rams which had been in contact with her were isolated for a further period of one month, at the end of which they were found free from infection.

There is no evidence of the existence of Q fever in New Zealand and therefore it has been decided that certificates of freedom from serological evidence of infection should be submitted before shipment of animals from other countries to New Zealand is permitted.

The abortion was regarded as being caused by Q fever; examination of the foetal membranes showed oedema of the chorion, a firm and putty-coloured cotyledon in which whitish caseous areas were visible on pressure with a glass slide.

John W. D. Megaw

Moscovici, C. Resistenza di *Coxiella burnetii* ad alcune sostanze batteriche. [Resistance of *Coxiella burneti* to some Disinfectants.] [**Resistance of** *Coxiella (Rickettsia) burneti* **to Certain Disinfectants**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1953, v. 16, Pts. 4, 5 & 6, 232–5. English summary (4 lines).

The author has confirmed the finding of various observers that *Rickettsia burneti* is exceptionally resistant to various disinfectants. Rickettsial suspensions in saline were prepared from yolk-sac cultures and after treatment with the disinfectants were inoculated into guineapigs, whose sera were tested 30 days later by the complement-fixation test. Titres of 1–16 or over were regarded as showing survival of the rickettsiae.

Free chlorine at a strength of 100 mgm. per litre failed to sterilize the suspension after contact for a night at room temperature; at double this strength it was effective.

With H_2O_2, concentrations of 5 times those commonly used for disinfecting milk were needed to sterilize suspensions of the rickettsiae in milk and saline.

With phenol a strength of 1·0 per cent. was ineffective after 3 days' contact; 2·0 per cent. was effective after 24 hours, but not after 1 hour. 3·0 per cent. was effective within an hour.

The author points out that if anti-rabic vaccine is prepared from sheep spinal cord treated in the usual way with 0·5 per cent. phenol there is a risk of causing Q fever by the injections if the animal happens to have been infected with Q fever. Sodium merthiolate at a strength of 1–1,000 failed to sterilize after 7 days so that the usual strength of 1–10,000 would be quite inadequate. *John W. D. Megaw*

Winn, J. F., Lennette, E. H., Welsh, H. H. & Abinanti, F. R. **Q Fever Studies. XVII. Presence of** *Coxiella burnetii* **in the Feces of Naturally Infected Sheep.** *Amer. J. Hyg.* 1953, Sept., v. 58, No. 2, 183–7.

Rickettsia burneti was recovered at the time of parturition, and for 7 days afterwards, from the faeces of 2 out of 42 sheep known to be infected with Q fever. Rickettsiae could not be recovered from the faeces of these 2 sheep either 10 to 16 days before parturition or 14 days after this event. The infectivity of the faeces at lambing or within 24 hours of lambing was high, being 2×10^7 infective doses per gm. in one sheep and 2×10^4 in the other. When tested 3 days later the infective doses of the first sheep had fallen to 2×10^4 and those of the second sheep tested 2 days later to 2×10^3.

Rickettsiae were recovered from the faeces of "other sheep" among the group of 42, but not in association with parturition.

Contamination of the faeces from highly infective placentas was not regarded as a possible explanation of so heavy an infection of the faeces and of the persistence of infection for at least 7 days. Full details are given of the experiments. *John W. D. Megaw*

Stoker, M. G. P. **Variation in Complement-Fixing Activity of** *Rickettsia burneti* **during Egg Adaptation.** *J. Hygiene.* 1953, Sept., v. 51, No. 3, 311–21.

The present studies were prompted by the author's previous discovery of a great increase which occurred in the complement-fixing activity of 2 strains of *Rickettsia burneti* during a series of egg passages [see this

Bulletin, 1951, v. 48, 249]. One of these strains, the Christie strain, was available in a suspension of the spleen and lungs of a guineapig to which the infection had been passaged from the original guineapigs from which the strain was isolated. Nine passages of the strain were made through fertile eggs, and antigens were prepared from the yolk sacs of each passage. A homologous antiserum was obtained four months after the onset of his illness from the patient from whom the strain had been isolated. This serum had a high titre of complement-fixing antibody but showed poor ability to agglutinate *R. burneti*, so that sera from other sources were used for agglutination tests.

Antigens of the third and fourth egg passages gave negative or very weak complement-fixation reactions with the patient's serum, but those of the fifth and later passages gave reactions at a titre of 1 in 160, which was the same as given by Henzerling-strain antigen.

In agglutination reactions and antiglobulin sensitization tests the antigen of the third passage was found to absorb antibody nearly as well as did antigen of the ninth passage and Henzerling antigen.

The main interest of the findings lies in the ability of the rickettsial antigen to combine with antibody without fixing complement; this feature is of importance in connexion with the preparation of antigen from some freshly isolated strains for complement-fixation tests. The significance of the findings is discussed but no dogmatic opinion is expressed and the need for further study of the problem is mentioned. From the point of view of diagnosis the need for standardized antigen is obvious.

John W. D. Megaw

Germer, W. D. & Schauber, W. Q-Fieber-Meningitis in einem endemisch verseuchten Gebiet. [**Q Fever Meningitis in an Area of Endemic Infection**] *Deut. med. Woch.* 1953, Sept. 4, v. 78, No. 36, 1209–10 [18 refs.]

A woman aged 31 was attacked by chronic aseptic lymphocytic meningitis 10 days after the onset of an attack of Q fever, when the temperature had already fallen to normal. The first symptom was stiffness of the neck; the Kernig sign was positive; the cerebrospinal fluid had 243 cells per cmm.; 70 per cent. of these were lymphocytes. After about 8 weeks the patient's condition had improved and the cell count had fallen to 55 per cmm. Five months later she had returned to work, but still had pains in the head and neck and felt weak.

The complement-fixation test with Henzerling antigen was positive at a titre of 1–128 two months after the onset and rickettsiae were isolated from the cerebrospinal fluid by guineapig inoculation. Infection was traced to a flock of sheep; sera of 21 of these were tested and 9 gave positive fixation reactions at titres of 1–16 to 1–64. Rickettsiae were recovered from the placenta of one sheep, from the pooled milk of 12 sheep, and from a sheep-tick described as a species of *Haemaphysalis*. *John W. D. Megaw*

Hughes, M. H. **A Rickettsial Disease of Goats in the Gold Coast.** *Ann. Trop. Med. & Parasit.* 1953, Oct., v. 47, No. 3, 299–303. [10 refs.]

Seven Anglo-Nubian goats, freshly imported from Great Britain, arrived at a farm near Accra on December 31, 1952. One died of pneumonia and pleurisy on January 16, 1953, the others remained healthy till February 25 when 3 of them died suddenly after a fulminating illness lasting from 30

minutes to less than 4 hours. The remaining 3 goats died on March 12, March 29, and April 1 respectively; 2 of them were treated with chloramphenicol which may have delayed death; this occurred after 7½ hours in one case and after 32 hours in the other.

A veterinary officer who was present at the autopsy of one of the goats suggested that the cause of death was heartwater, a disease of which he had considerable experience. Opposed to this diagnosis was the absence of rickettsiae from the vascular endothelium and the transmissibility of the infection through guineapigs, which reacted to inoculation of brain suspension of the goat with fever and the development of abundant rickettsiae in the spleen. A native goat was found immune to inoculation. The infection was passaged 3 times through guineapigs and then was lost accidentally. Two guineapigs immunized to murine typhus failed to react to inoculation with material from a guineapig of the second passage; this cross-immunity between the disease and murine typhus prompted the author to carry out the following experiment. A "Niger sheep", a variety which is believed to be susceptible to heartwater, was obtained and inoculated subcutaneously with a strain of murine typhus of the twelfth passage; there was no febrile response but a rising-titre reaction was observed with *Proteus OX2*, *Pr. OXK* and *Pr. OX19*; the initial titres were 1 : 20; nil and 1 : 40 respectively and in each case the titre rose to 1 : 160.

The author speculates on the possible relationship of the disease to heartwater, murine typhus, and tick typhus; he suggests that it is very probably identical with one or other of these diseases which, however, he thinks may not be "due to entirely different agents, but that rickettsiae may become modified by passage through different hosts, and so produce apparently different diseases in any one animal species". He states that he may be justified in making these speculations by the work of Giroud *et al.* "who recently demonstrated that by passage through different animal tissues and hosts a strain of *R. conori* could be converted into a rickettsia morphologically and serologically resembling *R. mooseri*". [See this *Bulletin*, 1953, v. 50, 921.]

There can be no objection to the speculations in so far as they "indicate the need for much further investigation". *John W. D. Megaw*

Mooser, H. & Weyer, F. **Experimental Infection of *Macacus rhesus* with *Rickettsia quintana* (Trench Fever).** *Proc. Soc. Exper. Biol. & Med.* 1953, Aug.–Sept., v. 83, No. 4, 699–701, 2 figs.

The authors describe the successful inoculation, by the intravenous route, of 7 rhesus monkeys with *Rickettsia quintana* contained in suspensions of the intestines of heavily infected lice. The occurrence of infection in the monkeys was demonstrated by inoculating their diluted blood into clean lice by Weigl's intrarectal method. Six of the monkeys were found to have rickettsaemia when they were first tested, 6, 7, 8, 8, 9 and 16 days respectively after inoculation; the seventh monkey was negative on the seventh day and positive on the sixteenth day. The rickettsaemia of the monkeys persisted for 10 to 82 days. In each test 25 to 50 lice were inoculated and the rate of infection in the different batches ranged from 39 to 100 per cent. Some batches of lice were inoculated intracoelomically with similar results.

Two batches of adult female lice were fed, each on a different monkey; 79 and 100 per cent. respectively became infected. A batch of larval lice were fed on another infected monkey and only 10 per cent. became infected.

The rates of infection of lice in the above experiments were much higher

than those sometimes observed among lice which had fed on infected patients. The only signs of infection among the monkeys were that some of them became restless 6–7 days after inoculation and that 3 had slight irregular rises of temperature. Four different strains of rickettsiae were tested; one had been isolated from prisoners of war in Jugoslavia; it had already caused trench fever in 9 persons by experimental inoculation, and in 3 persons who were accidentally infected. This strain was inoculated into 4 of the monkeys. The other 3 strains, each of which was inoculated into a different monkey, were isolated in Hamburg; 2 of them came from lice which had fed separately on 2 healthy laboratory attendants with no previous history of trench fever. The authors' comment on this occurrence is, " according to previous conceptions these 2 strains would have to be classified as *R. pediculi*, Rocha Lima, 1917 ". The third Hamburg strain came from a person who had served as a feeder of lice for several years and had recently suffered from intermittent fever and headache for a week during which lice fed on him remained free from infection, but after successful treatment with aureomycin he infected 100 per cent. of the lice fed on him and continued to infect lice for at least 4 months. The Hamburg strains had been maintained solely by Weigl's method of passage through lice.

The authors mention that *R. quintana* is remarkable for its strict host specificity, no small laboratory animal is susceptible, attempts at culture in chick embryos and living tissues have always failed, and the only arthropods in which growth and survival occur are human lice.

[The authors' findings and their references to their personal experience of trench fever seem to lend strong support to the view that in normal conditions the disease lurks in a mild or inapparent form in which it escapes detection among the infected communities and that the virulence of the rickettsiae becomes increased in the same conditions as are associated with severe epidemics of typhus fever.] *John W. D. Megaw*

BARTONELLOSIS

HERRER, A. **Carrión's Disease. I. Studies on Plants claimed to be Reservoirs of** *Bartonella bacilliformis*. *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 637–43, 2 figs. on pl. [10 refs.]

Travellers may sometimes develop Carrión's disease in uninhabited regions of Peru, and for this reason it is thought that a non-human reservoir of the infection may exist. The latex of 2 species of Euphorbia (*Jatropha macrantha* and *J. basiacantha*) has previously been found to contain organisms resembling *Bartonella bacilliformis*, and the present investigation was made to see if this observation could be confirmed. Plants were sent from the Andes to Minnesota where cuttings were planted. The latex was inoculated into Noguchi's semi-solid leptospira medium, or less often into blood agar, with negative results up to a month, and after subinoculation. Specimens of Euphorbia grown from seed were inoculated with cultures of *B. bacilliformis*, but in no cases could the organism be recovered, even from the actual site of inoculation. It was proved that *Bartonella* was able to grow in leptospira culture medium in the presence of latex only at a dilution of 1 in 50 or less. A Euphorbia reservoir of the infection is thus most unlikely. *P. C. C. Garnham*

Herrer, A. **Carrión's Disease. II. Presence of *Bartonella bacilliformis* in the Peripheral Blood of Patients with the Benign Form.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 645–9.

Observations were made on pupils of the Agricultural School at San Juan, Peru. The buildings were treated with DDT in June 1947 and it was assumed that from that date sand-fly transmission of Carrión's disease became impossible. At the same time blood cultures were made from 81 students and in 7 *Bartonella bacilliformis* developed. Cultures were attempted monthly till December 1947 from the cases positive in June. One was positive for 4 successive months, the others became negative after 2 to 4 months, even though the verruga eruption appeared later. This demonstrated that the infection must have been present although it was undetectable by blood culture. The results showed also that this method of diagnosis has the best chance of success during the first months of infection. Three cases with positive blood cultures were completely asymptomatic. *P. C. C. Garnham*

Herrer, A. **Carrión's Disease. III. Experimental Infection of Squirrels.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 650–54. [14 refs.]

Four Peruvian strains of *Bartonella bacilliformis* were used to determine the susceptibility of squirrels to the infection. Washed suspensions of the organism were inoculated intradermally, intravenously or both. Five of 10 grey squirrels (*Sciurus carolinensis*) became infected, showing the organism either at the site of intradermal inoculation (but not elsewhere in the skin) or in the blood. The former inoculations were accompanied by marked skin reactions, though no actual nodules developed, and it was later proved that uninfected culture medium produced the same effect, which was therefore non-specific. Three of 18 ground squirrels (*Citellus tridecemlineatus*) gave positive cultures but only from 24 to 48 hours after inoculation. Only newly isolated strains of the organism gave rise to infections—all of which were asymptomatic. The cultures were accompanied by the presence of a *Grahamella*-like organism which was particularly common in the ground squirrels. *P. C. C. Garnham*

YELLOW FEVER

Dick, G. W. A. Yellow Fever. **A Problem in Epidemiology.** *Brit. Med. Bull.* 1953, v. 9, No. 3, 215–20. [Numerous refs.]

A very full and authoritative discussion by a worker of wide experience. Readers of this *Bulletin* will be familiar with the work summarized in this paper.

MacNamara, F. N. **Uganda S and Yellow Fever Viruses. A Slight Relationship shown by Experiments in Rhesus Monkeys and White Mice.** *Brit. J. Exper. Path.* 1953, Aug., v. 34, No. 4, 392–9.

MacNamara has shown that sera of monkeys immunized against Uganda S or yellow fever virus show some neutralization of the heterologous virus, though this is much less than that of homologous virus. [The number of monkeys on which this conclusion is reached is small and the cross relationship of a low order.] In cross-immunity experiments in mice, it was found

that mice immunized with Uganda S virus developed a marked resistance to the homologous virus, and a slight immunity to yellow fever virus. A similar, but less marked, relationship was seen in mice immunized with yellow fever virus and challenged with the homologous and with Uganda S virus. A similar picture can occur in man. A rise in the Uganda S neutralization index from 4 to 1,500-fold has been found in the acute- and convalescent-phase sera of 6 patients who were observed during an epidemic of yellow fever and diagnosed by serum tests and isolation of virus.

The author notes that infection with Uganda S virus is relatively common in Southern Nigeria. The sera of 72 per cent. of 32 children in south-western Nigeria showed protection against 100 or more LD50 of virus, and another 16 per cent. against 50–100 LD50 in intracerebral protection tests. Of the same group 63 per cent. had yellow fever antibodies, yet no yellow fever had been reported from the area for a period longer than the age of most of the children. This may be due to the fact that in the area concerned yellow fever is a children's disease and children do not suffer as much as adults, or possibly that the disease had been modified [presumably by Uganda S virus infection].

[This paper also brings up the important question whether a high level of antibody to Uganda S virus in human beings may not give rise to an inconclusive yellow fever neutralization test result when a 1 per cent. virus test is employed. Further work is required on this subject.]

G. W. A. Dick

Brick, I. B. **Residuals of Yellow Fever Vaccine after Ten Years. A Medical and Legal Problem.** *Arch. Intern. Med.* 1953, Aug., v. 92, No. 2, 221–7. [Refs. in footnotes.]

A review has been published in the *Bulletin of Hygiene*, 1954, v. 29, 18.

Elliott, R. & Fitz-John, R. A. **Trials of a Portable Fog Generator for Mosquito Control in West Africa.** *Monthly Bull. Ministry of Health and Public Health Lab. Service (directed by Med. Res. Council).* 1953, Sept., v. 12, 178–86.

For checking an epidemic of yellow fever, immediate reduction in numbers of *Aëdes aegypti* mosquitoes is important. Insecticide applied by hand atomizers ("flit guns") has been successfully used in urban areas, but this method is slow and must be carefully supervised. Continuous pumping of a hand atomizer is very tiring and operators tend to skimp their work unless watched. Under the best conditions, not more than about 6 houses can be treated per hour by each sprayer.

The aerosol bombs used in aircraft disinsectization would be effective, but would prove too expensive for mass treatments. Therefore the authors have considered various types of mechanical aerosol generators for this purpose.

The well known Todd Insecticidal Fog Applicator (TIFA) apparatus is too heavy (950 lb.) and cumbersome for use in rural West Africa. Of the other types considered, the "Swingfog" machine seemed most practical. It is a portable fog generator operating on the pulse-jet principle; a series of fuel plus air charges, fired in the combustion chamber, produce pressure waves along the exhaust pipe. The insecticide is injected into this pipe and vaporized to give a fog. After the apparatus has been started by means of a 6 volt battery, the operation is self-perpetuating, the only moving parts being 2 flexible valves regulating air intake.

The machine weighs 35 lb. full. It runs for three-quarters of an hour on its quart fuel tank, during which period the 7-pint insecticide tank will be

emptied 3 or 4 times. The trials to be described confirmed the claim that an ill-constructed village house of 5,000–7,000 cu. ft. could be treated by 1 minute's operation of this machine.

Various types of oils or oil-in-water emulsions can be used to produce the insecticidal mist. The emulsions are cheap and free from fire risk and, from a few tests by the authors, appear to be about as effective as the oil solutions. They have, however, the most important drawback of producing almost invisible fog, which makes it difficult for an unskilled operator to direct the jet effectively or observe the progress of the work. Of oil solutions, the choice lay between gas oil or Malariol, both locally available, and the heavier type recommended by the manufacturers of the machine. The latter was free from fire risk but its uncertain availability in West Africa (and expense) make it practically certain that locally available materials would be more likely to be used sooner or later.

The first trial, in lightly built village houses near Lagos, compared the following: pyrethrins (1·3 per cent.) in oil, DDT in oil, DDT emulsion, BHC in oil, BHC emulsion. The DDT was used at 5 per cent. and the BHC at 0·5 per cent. of the *gamma* isomer. Results were judged by kills (in 1 to 4 hours) of fed *Aëdes aegypti* females in small wire cages. The pyrethrins gave rather poor results and were discarded because of very high cost. The best results were by BHC in oil and BHC and DDT emulsions. The emulsions were not tested further for the reason mentioned. Another trial of DDT and BHC solutions in gas oil again gave good results, especially the latter. In a third trial, dishes of water containing third stage *Aëdes* larvae were exposed at different distances downwind from the point of emission of the fogs. After 24 hours a complete mortality was obtained up to 15 yards with DDT and 25 yards with BHC.

Further trials were conducted in a large room (2,000 cu. ft.) with the mosquitoes in rather larger (1 ft. cube) cages to approach more nearly to natural conditions where the insects would be free to fly. In these conditions even better results were obtained, all insects being killed in 4 hours after a 20-second burst of DDT-fog. Observations during this type of test proved that the mosquitoes were irritated by the fog which tended to make them fly. Under natural conditions this would increase their pick-up of insecticide.

It was concluded that the " Swingfog " machine is a practical method of rapidly destroying adult mosquitoes (and larvae nearby) in African houses. A 2- or 3-man team could treat 20 houses per hour in a 6-hour day. The total cost (including wages) would be £3, or 6d. per house.

One disadvantage should be mentioned. If the more volatile locally available fuel oil (not recommended by the manufacturers) is used there is some risk of the fog jet igniting, giving a flame 3–4 ft. long. The danger from this possibility can be minimized by keeping the machine on the ground, away from inflammable materials. *J. R. Busvine*

See also p. 18, Owens, Programas cooperativos de control de insectos en Centro América. [**Cooperative Insect-Control Programmes in Central America.**]

See also this *Bulletin*, 1953, v. 50, 1088, Charles, **Re-Infestation Problems in an *Aëdes aegypti*-Free Area in British Guiana.**

DENGUE AND ALLIED FEVERS

HOTTA, S. **Treatment of Mouse-Passaged Dengue Virus (Mochizuki-Strain) with Protamine Sulfate.** [Correspondence.] *Science.* 1953, Aug. 28, v. 118, 255.

Some strains of viruses may be precipitated in crude suspensions by the addition of protamine sulphate: many of these fall into 2 groups, those precipitated by protamine (the large-size viruses) and those not so precipitated (smaller size) [*Bulletin of Hygiene*, 1951, v. 26, 438]. The present author has already conducted experiments on protamine treatment of the mouse-passaged Mochizuki strain of dengue virus [this *Bulletin*, 1952, v. 49, 687].

He now gives details of 3 experiments in which the brains of mice intracerebrally infected with dengue virus were ground into a 20 per cent. emulsion in distilled water, adjusted to *p*H 7. This was centrifuged at 3,000 r.p.m. for 15 minutes. The supernatant was the original virus suspension and to this was added protamine sulphate (prepared at Kyoto University, Japan), at a concentration of 5 mgm./ml. The mixture, containing flocculates, was kept at 0°C. for 24 hours, then centrifuged at 3,000 r.p.m. for 60 minutes. The resultant supernatant was slightly opaque: it was tested for virus concentration by 10-fold titration in mouse brain and the original suspensions were similarly titrated. The nitrogen content was also determined.

The results are shown in a table, which indicates that the dengue virus remained in abundance in the protamine supernatants and that it can therefore be included in the "protamine-non-precipitated" group of viruses described by WARREN [*loc. cit.*]. *H. J. O'D. Burke-Gaffney*

RABIES

BÉQUIGNON, R. & VIALAT, C. Les vaccinations antirabiques à l'Institut Pasteur en 1952. [**Anti-Rabies Vaccination in the Pasteur Institute in 1952**] *Ann. Inst. Pasteur.* 1953, Sept., v. 85, No. 3, 308–15.

This report differs from its predecessors [this *Bulletin*, 1952, v. 49, 1041] in that it is divided into two parts, owing to an alteration in methods of vaccine preparation during the year. On April 1st, 1952, the preparation of vaccine from dried cords, which had been in use since 1885, was abandoned in favour of a 5 per cent. emulsion of sheep's brain in 1 per cent. phenol saline. The principal figures for the first quarter and the last three-quarters of the year are shown below.

	1st Quarter	*2nd–4th Quarter*
Patients attending	62	310
Patients vaccinated	19	77
Biting animals—		
Owned dogs	8	28
Stray dogs	10	41
Owned cats	1	4
Stray cats	—	3
Fox	—	1
Deep wounds	14	46

	1st Quarter	2nd–4th Quarter
Wounds on bare skin	14	38
Upper limbs bitten	13	35
Head bitten	1	11
Number treated within 1 week of bite	15	58
Number treated between 1 and 2 weeks of bite	3	14
Deaths	—	—
Paralytic accidents	—	—

H. J. O'D. Burke-Gaffney

Nelson, E. A. & Anderson, H. D. **Potencies of Phenolized Rabies Vaccine improved by Addition of Merthiolate during Inactivation.** *Applied Microbiol.* Baltimore. 1953, May, v. 1, No. 3, 135–7.

Because bacterial antigens, toxins and toxoids have been reported as giving better antibody responses if preserved with merthiolate, the authors tried the effect of merthiolate on phenolized rabies vaccine. Three kinds of vaccine were prepared and tested: (1) a Semple-type vaccine made by holding at room temperature for 17 to 20 days a 40 per cent. virus brain suspension in 0·85 per cent. NaCl with phenol at a concentration of 0·8 per cent; when non-infective, this vaccine was diluted to a tissue concentration of 6·66 per cent., and merthiolate was added to 1 in 10,000; (2) a very similar vaccine, differing from the first only in that merthiolate to 1 in 10,000 was added to the 40 per cent. brain suspension along with the 0·8 per cent. phenol, and was therefore present during the attenuation period; (3) a vaccine prepared by ultraviolet irradiation. Merthiolate was also added to this vaccine in a concentration of 1 in 10,000 after irradiation.

The potencies of the 3 vaccines were tested by the method of the National Institute of Health for Minimum Requirements of Rabies Vaccine.

The second kind of vaccine, in which merthiolate and phenol had both been added before the attenuation period, proved about 9 times as potent as the simple phenolized vaccine and about equally as potent as the UVL-treated vaccine.

The merthiolate vaccine has been in use in the State of Michigan for 4 years, during which approximately 27,000 doses of rabies vaccine were used, with no serious reactions and no human cases of rabies.

[This work, if confirmed, is important, because of the ease of the method.]

E. T. C. Spooner

Hosty, T. S. & Hunter, F. R. **Incidence of Reactions to Antirabies Horse Serum.** *Pub. Health Rep.* Wash. 1953, Aug., v. 68, No. 8, 789–91.

Two children having recently died from rabies in Birmingham, Ala., despite 14 injections of Semple vaccine, hyperimmune rabies serum, in the form of Lederle's horse serum concentrate, was made available. Serum was not used on those bitten 72 hours or more before the serum could be given. The dose used was 0·25 ml. per pound body-weight intramuscularly. Serum was followed in 24 hours by at least 7 injections of Semple vaccine, unless a shorter course was indicated by the condition of the biting dog.

Patients were skin-tested with the serum before it was administered. Of 32 patients, 8 had attacks of serum sickness, of which 3 were severe

and 2 moderate. This reaction rate is not high enough to contraindicate serum prophylaxis.

Ten of the patients were bitten by dogs proved rabid, although the submaxillary glands were tested in only one dog, in which case they yielded virus with LD50 of 10^{-4}. Four patients were bitten by dogs in which the diagnosis of rabies was doubtful.

Of the patients bitten by proved rabid dogs, 7 had face bites, 2 finger bites and 1 leg bite. Of those bitten by doubtfully rabid animals, 2 had face bites and 2 finger bites. None of the patients had developed rabies at the time of writing [dates not given].

The authors discuss these results and the general evidence concerning the use of hyperimmune antirabies serum, and conclude that further experience is needed to determine the value of the serum, and whether it will be justifiable to rely on it without vaccine treatment.

[The guarded conclusion at which the authors arrive is undoubtedly correct; but the probable value of hyperimmune serum prophylaxis appears to be such as to make the careful collection of further evidence a matter of urgency. A WHO trial is in progress. It is clearly essential to place a prophylactic of this importance on a very sure footing before it is generally released. On the other hand, records as careful as that presented in this paper are valuable, provided that they contain the fullest possible account of the presence or absence of virus in the saliva of the offending animals. It is unfortunate, in the present series, that the salivary glands were examined in one animal only, and that there is nothing to indicate the length of time over which the patients were observed.] *E. T. C. Spooner*

PLAGUE

Pollitzer, R. **Plague Studies. 8. Clinical Aspects.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 1, 59–129. [221 refs.]

This is the 8th of the series of studies which when complete will be published as a manual of plague in English and French editions.

It deserves the same high praise as has been given to the earlier studies reviewed in this *Bulletin*. The World Health Organization is to be congratulated on having sponsored the production of this book which will take its place as the standard work on the disease. Dr. Pollitzer has exceptional linguistic attainments, personal experience of the disease, sound judgment and untiring industry, qualities which are rarely combined in one worker, but even these would not have sufficed if WHO had not provided him with the opportunity of giving his whole time to the preparation of the studies.

This section contains 221 references to the literature dealing with the clinical aspects of the disease. The description of the symptomatology contains numerous quotations from the publications of observers in different parts of the world; it thus avoids the fault of deceptive simplicity which so often mars descriptions of the disease by authors who rely only on their own experience of the disease in one area.

The recent advances in the chemotherapy of plague are fully described.

John W. D. Megaw

Pollitzer, R. **Plague Studies. 9. Epidemiology.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 1, 131–70. [103 refs.]

The comments on the preceding studies apply equally to this, the 9th of the series, which deals with the epidemiology of plague. The subject abounds in difficult and controversial problems which are discussed by the author in his usual impartial manner.

The classification adopted is (1) Bubonic (Zootic) Plague, and (2) Primary Pneumonic (Demic) Plague. The words in brackets which indicate, respectively, plague transmitted from lower animals, and from human beings, were proposed by the reviewer as being more suitable for the classification of the disease than the author's original names, which were (1) Bubonic Plague, including Septicaemic and Secondary Pneumonic types and (2) Primary Pneumonic Plague. The reviewer's objection to the latter classification was that the name bubonic was hardly suitable for types in which buboes were absent or incapable of detection [see this *Bulletin*, 1952, v. 49, 857].

The classification now adopted by the author goes a long way towards meeting this objection by indicating that all the forms of plague transmitted from lower animals to man are included under the name bubonic, and that primary pneumonic plague is transmitted from man to man. The author's objection to the reviewer's proposed classification under the names zootic and demic was stated in the preceding (8th) study reviewed above; it was that " However desirable though it would be to adopt this terminology, it would seem rash to make general use of these startlingly new names in the present study ". The reviewer as a consistent opponent of unnecessary new names understands and sympathizes with this attitude, though he still thinks that the main classification based on epidemiological features would be less ambiguous and more useful.

In the discussion of the epidemiology of primary pneumonic plague it is admitted that no satisfactory answer has been given to the question: why are outbreaks of this form of the disease consistently self-limited even in the absence of measures of control? The evidence available from the literature on the other problems of this form of the disease is fully stated.

John W. D. Megaw

Swellengrebel, N. H. **Researches on Ectoparasites of Man in the Vicinity of Marrakech (Morocco).** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, June, v. 5, No. 2, 151–6.

Blanc and Baltazard [this *Bulletin*, 1944, v. 41, 281] set forth facts showing that in Morocco transmission of bubonic plague from man to man occurred, contrary to the established concept for other parts of the world that transmission took place only from rats to man by rat fleas. The author visited Marrakesh in Morocco in 1953 to compare the ectoparasite population of the peasants with similar data collected in 1912 from the people of Malang in Java. It is shown that there were about 70 times as many fleas and 6 times as many lice per person in Morocco as in Java. Most of the fleas were *Pulex irritans*, a few being *Xenopsylla cheopis* and *Ctenocephalides*. The difference for the 2 countries in ectoparasite densities per person is explicable by the thick layers of clothing and less frequent ablutions of the Moroccan peasants. Some points are noticed indicating (for Morocco) that general usage of DDT and BHC insecticides by the peasants has considerably reduced the number of fleas and lice during the past few years. It is concluded that transmission of plague from man to man by *Pulex*

irritans may occur in any country where conditions permit heavy infestation of clothing with this flea. *D. S. Bertram*

Girard, G. Le sérum antipesteux, associé aux antibiotiques, garde ses indications dans les formes hypertoxiques de la peste. [**Antiplague Serum in Addition to Antibiotics is still Indicated in Hypertoxic Forms of Plague**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 526–32.

The author strongly advocates the continued use of antiserum in addition to the new antibiotics in the treatment of plague, especially in the early stages of the illness when the toxic factor often preponderates over the bacterial. Aureomycin is said to be the only antibiotic which has been shown to have an antitoxic action in experimental conditions [this *Bulletin*, 1951, v. 48, 254].

References are given to reports by competent observers who have described excellent results from the use of antisera in the early stages of the disease. Hopes are expressed of the production of more potent sera, and mention is made of the preparation in lyophilized form of a *gamma* globulin from the serum of hyperimmunized rabbits. This had not been tested in human cases at the time of writing but it appears to be the preparation used with discouraging results in the later stages of experimental attacks in monkeys as described by McCrumb *et al.* [see this *Bulletin*, 1953, v. 50, 934]. *John W. D. Megaw*

See also p. 15, Mercier and Razafindrakoto, Bilan de trois années de campagnes de désinsectisation domestique à Tananarive. [**Results of Three Years of Residual Insecticide Spraying in Tananarive**]

CHOLERA

Gallut, J. Relations antigéniques entre vibrion cholérique et brucelles. II.—Sur la fraction antigénique thermostable commune. [**Antigenic Relationships between Cholera Vibrios and *Brucella* Organisms. II. The Common Heat-Stable Fraction**] *Ann. Inst. Pasteur.* 1953, Aug., v. 85, No. 2, 261–2.

In a previous paper [see this *Bulletin*, 1951, v. 48, 255] the author had reported his observations on a heat-stable (O) antigenic fraction common to *V. cholerae* and *Br. abortus suis* and *Br. melitensis*: this he found to be in the C factor characteristic of the Inaba form of the vibrio, of which the formula is AC. The question has now been studied whether it is possible to obtain a pure A-type serum by absorption of anti-Inaba (AC) serum with *Br. abortus suis*. The examinations made showed that the relationship is only partial and *Br. abortus suis* does not fully exhaust the C antibody from AC serum. A pure mono-specific A serum cannot therefore be obtained by this method. *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Brooke, M. M., Otto, G., Brady, F., Faust, E. C., Mackie, T. T. & Most, H. **An Analysis of a Memorandum on the Diagnosis of Amebiasis.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 593–612, 1 fig.

The authors point out that the clinical and laboratory diagnosis of amoebiasis is difficult, and that there is little or no agreement in published works on the best methods of making it. In order to clarify the situation they issued a questionary to those concerned with amoebiasis in the United States. The questionary contained 115 statements or questions for comment or answer; the immediate purpose of the present paper is an analysis of the 93 replies they received. These replies, however, merely confirm that the present position in regard to the diagnosis of amoebiasis is confused; but the authors say that the confusion is probably more apparent than real, as scientists are reluctant to make " black or white commitments " and qualify their responses so as not to omit rarities and exceptions.

[Such a paper obviously cannot be summarized briefly, so it must be consulted in the original by those interested. Whether it has indeed clarified the subject or advanced knowledge is a matter of personal opinion.]

A. R. D. Adams

Dolkart, R. E. **The Diagnosis and Treatment of Amebic Dysentery.** *J. Amer. Geriatrics Soc.* 1953, July, v. 1, No. 7, 477–85. [12 refs.]

Entamoeba histolytica infections variously are said to occur in 3 to 30 per cent. of the population in the U.S.A. Since 1946 the stools of 3,057 patients suffering from gastro-intestinal disorders, or from undiagnosed febrile illnesses, have been examined for this parasite at the laboratories of the Northwestern University Medical School in Chicago, Illinois. Sera from 605 of these patients, selected at random, have been tested by complement-fixation tests with an amoebic antigen at the National Institutes of Health at Bethesda, and the Communicable Disease Center, Chamblee. Of the 3,057 patients, 225 (7·36 per cent.) were found to be passing *E. histolytica* in the stools. Of the 605 patients who were examined by the complement-fixation test with an amoebic antigen 40·5 per cent. gave positive tests; but only 12·2 per cent. of these yielded parasites in their stools. A positive stool finding but negative complement-fixation test was obtained in 62·2 per cent. of the patients on whom both examinations were done. The complement-fixation test therefore is of limited, if of any, diagnostic value in amoebiasis.

The author is of the opinion that all diagnosed amoebiasis, whether symptomatic or asymptomatic, should be eradicated and he discusses the means to this end.

A. R. D. Adams

Demuynck, R. Een geval van amoebiasis vaginalis. [**A Case of Amoebic Vaginitis**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 203–5.

Report of a case of ulceration of the posterior wall of the vagina in an African woman of 45 by *Entamoeba histolytica*. The condition was cured by emetine. [See also this *Bulletin*, 1949, v. 46, 742; 1950, v. 47, 43, 467; 1952, v. 49, 398.]

H. J. O'D. Burke-Gaffney

Rosenstiel, R. Les formes pseudo-occlusives de la dysenterie amibienne. [**" Pseudo-Occlusive " Forms of Amoebic Dysentery**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 501–3.

An account of recurring attacks of what seems to have been gaseous colic in 5 patients with amoebiasis. This was considered to be causative as treatment with emetine is claimed to have arrested the troubles [in one case after 5 months' treatment]. *A. R. D. Adams*

Mahajan, K. R. **Chronic Intestinal Amoebiasis.** *J. Indian Med. Ass.* 1953, Sept., v. 22, No. 12, 490–92. [11 refs.]

The report is based on 100 cases of chronic amoebiasis seen in the civilian population of the north-western districts of Uttar Pradesh, India, during 1951 and 1952. The patients were between the ages of 8 and 60 years.

The main symptoms encountered were :—

abdominal pain—94 per cent.; irregular stools—60 per cent.; mild pyrexia—55 per cent.; marked loss of weight—30 per cent.; anaemia and hypotension—50 per cent.; burning feet syndrome—25 per cent.; psychoneurotic symptoms—60 per cent.

All were positive for cysts of *E. histolytica* and Charcot-Leyden crystals were found in 68 per cent. of specimens of stools.

The course of treatment was as follows :

(A) For first three days :

(i) Sulphatriad tablets, 2 every four hours dissolved in water, making a total of 18 gm. in three days.

(ii) Procaine penicillin sodium G., 400,000 units injected daily. After completion of part A of the course part B was begun.

(B) (i) Di-iodohydroxyquinoline [Diodoquin] tablets, 3 tablets twice daily after food for 20 days.

(ii) Emetine hydrochloride 1 grain, intramuscularly once daily for 2 days, to begin on the same day as the diodoquin.

(iii) Emetine-bismuth-iodide tablets 1 grain (sugar coated) one daily to begin two days after the last emetine injection [duration not stated].

(iv) Carbarsone tablets 4 grains one thrice daily after food for 6 days.

No untoward effects were noticed with any of the drugs, except emetine-bismuth-iodide. The pyrexia disappeared immediately after the sulphatriad-penicillin course. Patients began to show gradual improvements in weight. All have been followed up for a year and none has shown any signs of relapse.

[It must be admitted that the author has been particularly fortunate in his treatment, and the successful results are hardly in agreement with those obtained by the majority of observers.] *Philip Manson-Bahr*

Schneider, J. & Dupoux, R. Traitement de l'amibiase intestinale par le *bis*-(*p*.arsonophénylamino) 1-2 éthane. [**Treatment of Intestinal Amoebiasis with " *bis*(p. arsonophenylamino)-1-2 éthane "**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 550–61.

The authors have already reported on the use of 4·763 R.P. [" *bis*-(*p*. arsonophénylamino)-1.2-éthane "] in the treatment of intestinal amoebiasis, [this *Bulletin* 1953, v. 50, 415]. They now add records of the treatment of 148 other patients, suffering from various types of intestinal amoebiasis

in Paris and in Tunis, with this compound. The immediate effect of treatment was excellent and there were no toxic side-effects attributable to it. The end result of treatment was less easy to assess, as only 92 of the 148 patients reported for re-examination over periods ranging from 1 to 11 months; of these 92 only 15 proved still to harbour the infection. It is stated that all those of the 15 who were treated with a second course of the drug were sterilized of their infections with but a single exception.

An associated *Giardia* infection was found in 10 patients with amoebiasis, 2 of these were freed of this parasite by the 4.763 R.P. treatment; in the remainder of those adequately followed up the *Giardia* infection persisted. The authors therefore advocate the concurrent administration of quinacrine [mepacrine] with 4.763 R.P. when *Entamoeba histolytica* and *Giardia intestinalis* infections are present together. *A. R. D. Adams*

Charmot, G. & Le Henand, F. Dix observations d'amibiase hépatique traitées par la terramycine. [**Ten Patients with Amoebic Hepatitis Treated With Oxytetracycline**] *Bull. Méd. de l'Afrique-Occidentale Française.* 1952, v. 9, No. 2, 259–64. [20 refs.]

Terramycin (oxytetracycline) is eliminated partly by the kidneys and partly by the liver and bile; this accounts for its value in the treatment of certain cholangites and acute cholecystites; it might also be expected to influence amoebic infections in the liver. Ten patients with hepatitis, presenting enlargement of a painful liver with fever, a leucocytosis and a raised erythrocyte sedimentation rate, all considered to be suffering from amoebiasis of the liver, were treated with 3 gm. of terramycin daily for a week, and then 2 gm. daily for a second week. Six of the patients were restored to health as a result of this treatment; they were observed to remain well over periods of observation of 2 to 6 months. Four patients did not respond as hoped for, and after 4 to 6 days of the treatment emetine or some other treatment was given additionally, or substituted, in 3 of them; the fourth patient appeared to be cured by the terramycin treatment but his erythrocyte sedimentation rate remained high and he suffered a clinical relapse which was treated with emetine.

Terramycin can be substituted for emetine when the use of the latter is contraindicated in hepatic amoebiasis. Combined emetine and antibiotic (terramycin or aureomycin) treatment gives a synergic amoebicidal effect and affords some protection against secondary infection of an amoebic liver abscess. *A. R. D. Adams*

Yoshimura, B. **Experimental Studies on the Amoebic Liver Abscess. I. Experimental Amoebic Liver Abscess in Rats.** *Keio J. of Med.* Tokyo. 1952, Dec., v. 1, No. 4, 313–21.

Seven strains of *Entamoeba histolytica*, some of them immediately on recovery from man and others maintained on Dobell-Laidlaw medium for periods of up to 180 days after isolation from man, were used in attempts to produce liver abscesses in rats. The first experiment was the injection of parasites, together with the mixed bacterial flora growing in culture with them, directly into the left lobe of the liver of the rats; the animals were killed and examined at intervals thereafter. Of 38 rats so inoculated and examined within 7 days 22 (58 per cent.) had liver abscesses; amoebae were recovered from the abscesses of 10 of the 12 rats killed and examined up to the 5th day after infection. No amoebae were recovered from abscesses

found in rats examined after the 5th day, though the incidence of abscesses in them was just as high: it is reasonable to infer that amoebae had been present in as high a proportion of these before the 5th day.

The abscesses ranged in size from that of a pin head to as much as 1·0 cm. in diameter; most were about 0·5 cm. in diameter. They could be classified into 3 types: small and hard with a thick wall; medium sized and rather soft but with a thick wall; and large and soft with a thin wall. The first type, which contained typical bacterial-type yellowish green pus, never yielded amoebae; the second, which contained sticky brownish-green pus, sometimes did so; and the third, consisting of chocolate-coloured broken-down liver material, commonly did so.

It was not possible to obtain amoebae free from mixed bacterial growths, and so it could not be established if the inoculation of amoebae alone would cause liver abscess formation. But the accompanying bacteria could readily be freed from amoebae and these bacterial concomitants were injected intra-hepatically in the same manner. Abscesses resulted in a smaller number of cases (8 of 21 rats; *i.e.*, 38·0 per cent.) [there is a misprint in the relevant table] when bacteria only were injected than when both amoebae and bacteria were injected (14 of 22 rats; *i.e.*, 63·6 per cent.). The abscesses following the injection of amoebae-free bacteria were all of the inflammatory type and had a firm wall.

Attempts were then made to produce amoebic liver abscesses in rats by the introduction of an inoculum directly into the portal vein. Ten adult rats were thus inoculated with 0·5 ml. of a culture of amoebae together with their associated bacteria; but none of them developed liver lesions. Young rats were then used and 45 of them were similarly inoculated; 14 of these died within 24 hours; only one of the remaining 31 developed an abscess, and amoebae were not recovered from this.

Before the Second World War, human amoebic liver abscess was very rare in Japan, but since then it has been much more common; this has been ascribed to the introduction of virulent strains of the parasite from the South Pacific areas. Attempts were therefore made to assess the frequency of abscess formation in rats by differing strains of *E. histolytica*; 3 foreign and 3 indigenous strains of organisms were used for this purpose. In rats infected by direct inoculation of the liver with the foreign strain abscesses resulted in 85 (63·3 per cent.) of 133 animals, and from 20 (25 per cent. [*sic*]) of them amoebae were recovered. When indigenous strains were used 9 (50 per cent.) of 18 rats developed abscesses, and from none of these were amoebae recovered. In both cases many rats died as an immediate result of the inoculation and were discarded. This suggested that the virulence of the foreign strains of amoebae was greater than that of the indigenous strains of amoebae; the difference might be due to innate characters of the strain, or it might be due to the influence of the associated bacteria.

Finally, as it has been suggested that virulence may be attenuated by prolonged culture and exalted by subpassage in animals, rats were infected intestinally with strains of *E. histolytica*; fresh cultures were obtained from their stools; and these were inoculated directly into the livers of other rats. Four indigenous and 5 foreign strains of parasite were used. Of 18 rats so infected with indigenous strains and coming to post-mortem examination 17 were found to have abscesses; from 8 of these amoebae were recovered. Of 22 rats similarly infected with foreign strains and coming to post-mortem examination 18 had abscesses, from 10 of which amoebae were recovered. Of 157 rats similarly infected with an old strain of *E. histolytica* from man, maintained in serial subculture, only 98 developed abscesses and from 22 of

these amoebae were recovered. There was therefore no evidence of difference in the pathogenicities of foreign and of indigenous strains of *E. histolytica*, in so far as abscess production in the rat was concerned, provided the strains were passaged through the rat intestine shortly before inoculation; whereas maintenance in culture of strains obtained from man reduced its pathogenicity to the rat liver. An explanation may be that passage of a strain of *E. histolytica* through the rat intestine results in replacement of the associated bacterial flora by flora peculiar to the rat, and this has a greater adaptability to the rat liver than the flora of human origin found in cultures initiated from human stools.

[This paper is most interesting and informative; unfortunately the English text contains obvious misprints and errors.] *A. R. D. Adams*

Elsdon-Dew, R. & Freedman, L. **Coccidiosis in Man: Experiences in Natal.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, May, v. 47, No. 3, 209–14, 11 figs. (6 on 2 pls.). [15 refs.]

The authors demonstrated the existence of human coccidiosis in Durban in 1950 [see this *Bulletin*, 1951, v. 48, 366]; the present paper describes further cases and discusses the species of *Isospora* involved. They emphasize the importance of focussing right through the concentrated preparation in order to see the oöcysts which lie floating immediately under the coverslip —unless this procedure is adopted, the parasite will be missed. Three types of oöcyst were encountered: *Isospora belli* (32 cases), *I. hominis* (23 cases) and *I. rivolta* (1 case). *I. belli* tends to be more frequent in the warmer months of the year, the oöcysts are found in all stages of development, the oöcyst wall is clearly visible, the oöcyst measures 30 μ × 12 μ, with the 2 sporocysts measuring 11 μ × 9 μ and showing a residual body placed between the sporozoites. *I. hominis* is only present in the mature state, the oöcyst wall has disappeared leaving the 2 sporocysts either free or occasionally firmly stuck together, each one measuring 14–16 μ × 9–11 μ and with a residual body polar in position away from the sporozoites. The sporocysts of *I. hominis* resemble closely those of the canine *I. bigemina* and possibly the 2 species are identical; they were demonstrated not to be " spurious " parasites, because they were found in hospital patients for as long as 21 days and repeated contamination could hardly occur in these circumstances. *I. rivolta* showed the typical morphology of this species and was found in large numbers in a single case on one day out of 8.

P. C. C. Garnham

Manuel Balmaceda O., J., Martini H., J., Manuel Concha U., Jarpa G., A., Saavedra V., J. & Michell M., E. *Isosporosis humana.* [**Human Infection by** *Isospora belli*] *Bol. Informaciones Parasitarias Chilenas.* 1953, Jan.–Mar., v. 8, No. 1, 4–7, 1 fig. English summary (7 lines).

Authorities are not agreed on the pathogenicity of *Isospora belli*; some doubt it altogether, others regard it as causing diarrhoea of a dysenteric character. This present paper records 11 cases (9 in males, 2 in females) in which routine examination of the faeces discovered the presence of this parasite. All the subjects were well nourished; in 5 there was complaint of abdominal pain on deep palpation, especially in the right iliac fossa; there was fever to 39°C. in 5, and diarrhoea in 10. This last symptom was very variable, from 2 motions daily for periods up to 47 days; one had

20–30 a day for a fortnight, 2 others had periodic attacks for 5 and 10 years respectively. Blood examinations in 7 cases showed little leucocytosis —one patient had 10,000 per cmm., but another had only 4,100—and eosinophiles ranged between 3 and 13 per cent. Three of the patients were infected with *E. histolytica* also. Treatment by sulphonamides and by the antibiotics terramycin [oxytetracycline], chloramphenicol, penicillin and streptomycin singly and in combination did not get rid of the *Isospora* infection. *H. Harold Scott*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Walton, G. A. *Ornithodorus moubata* **in Wart-Hog and Porcupine Burrows in Tanganyika Territory.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 410–11.

Ornithodorus moubata is well known as a domestic tick and vector of relapsing fever to man in his dwellings in Africa. It has been reported twice as being common in pig sties in Southern Rhodesia and the Belgian Congo. Since 1915 it has been found on 5 occasions either on the backs of shot wart-hog or in burrows believed to be frequented by porcupine and wart-hog. These records are distributed as widely as Northern Rhodesia, northern Uganda and Kenya. The present paper provides several new localities, all in Tanganyika near Shinyanga or the Usambara Mountains, where this association of the tick with wart-hog and porcupine has again been observed. All stages of the tick, except eggs, are reported from burrows for which there is good evidence of their use by both these animals and, sometimes, hyena, jackal and python. The ticks were also found near Shinyanga in 2 hollow baobab trees. Precipitin tests of 2 specimens revealed the presence of pig blood in ticks from one of the burrows. The author and his colleague were attacked by large numbers of the ticks of all stages while examining the burrows. The ticks were lodged in the roof as well as on the floor of the burrow. No ill-effects followed their bites. Smaller burrows, possibly of the giant forest rat (*Cricetomys*), appeared to be free of tick although they were less than 30 yards from the larger tick-infested holes. *D. S. Bertram*

Kudicke, R., Kudicke, H., Grammel, H. & Linnhöfer, Annemarie. Über die Infektiosität von Rekurrenszecken, nach Versuchen mit *Spirochaeta hispanica* und *Ornithodorus moubata*. [**The Infectivity of Relapsing Fever Ticks, in Experiments with** *Spirochaeta hispanica* **and** *Ornithodorus moubata*] *Ztschr. f. Hyg. u. Infektionskr.* 1953, v. 137, No. 1, 13–27. [10 refs.]

The authors tested the susceptibility of *Ornithodorus moubata* to infection with *Spirochaeta hispanica* by means of inoculation and feeding experiments, using guineapigs, rats and mice. It was found that adult ticks invariably became infected when fed on guineapigs containing spirochaetes in the circulation, and also acquired the capacity for transmitting the infection, but in certain cases there was a long incubation period. Nymphs infected in the second stage became capable of transmitting the infection by bite only when nearly mature. These results do not agree with some of the results obtained by Grün [see this *Bulletin*, 1951, v. 48, 156] and some of

the negative results of Nicolle and Anderson [this *Bulletin*, 1928, v. 25, 91] but the authors consider that it is a speciality of their strain of *S. hispanica* to produce early development. Infected ticks had a progeny that in the first stage failed to produce infections, but in the second stage became infective.

The inoculation of salivary glands, coxal glands and ovaries from a group of infective ticks gave positive results only with the first two organs. The inoculation of 23 ovaries was entirely negative. On the other hand the inoculation of organs from a group of ticks that had not yet become infective, gave positive results with the coxal glands, ovaries and the organs remaining after removal of these glands. The negative results obtained with the salivary glands were not entirely conclusive since these organs were very toxic to the mice used in these experiments. When ticks were starved for long periods the infection died out of the coxal glands and ovaries but tended to persist in the " remaining organs ". The spirochaetes disappeared entirely in at least 10 out of 35 ticks.

The authors noticed a change in the strain, for all the ticks tested, whether infected by ingestion of blood containing spirochaetes, or hereditarily, showed a retardation in the appearance of infectivity. The organism seemed to lack the capacity of becoming established in the salivary glands, coxal glands and also in the ovaries, until after a very long interval.

A difference was observed in the behaviour of hereditarily infected nymphs and those infected by feeding on blood containing spirochaetes. This is considered to be due to the fact that in the former the spirochaetes had already become adapted to life in the tissues of the tick, while in the latter case this adjustment had first to take place.

The authors found that in their experiments the coxal glands, salivary glands and ovaries were only secondarily invaded and the infection was liable to die out. It was also found that lack of infectivity was not always permanent and that repeated negative feeding experiments do not guarantee that any ticks are free from infection. This can only be decided if the results are controlled by microscopic examination or the injection of the tick organs. For such experiments young nymphs are the most satisfactory as one can use large numbers simultaneously. *Edward Hindle*

YAWS AND OTHER TREPONEMATOSES

Hackett, C. J. Alguns comentários sôbre a epidemiologia e prevenção da bouba. [**On the Epidemiology and Prevention of Yaws**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, Jan., v. 5, No. 1, 5–9. English summary.

This is a paper contributed by the author to the Tenth Brazilian Congress of Hygiene which was held at Belo Horizonte in October, 1952. He tells of his experience in Africa where yaws is common 10° N. and S. of the equator. He refers in detail to an outbreak of the disease in one of two mines in South Africa; the other mine remained free. In the one 38 Europeans and 400 Africans were employed. In a little more than a year 67 Africans and 3 Europeans contracted yaws. In 42 of 55 consecutive patients observed, the primary lesion was on the (upper) arm in 8, the elbow in 11, the forearm in 14 and on the trunk in 9; they worked side by side in

such a way that their arms came into direct contact and the author concludes that 3 things conduce to the spread of the infection under the mining conditions present: first, an introduced case of yaws; second, warmth and humidity, and third, personal contact and small local skin lesions which form the portals of entry of the infection. Dr. Hackett stresses the point that the treatment of the yaws itself should be preliminary or preparatory to the undertaking of measures to improve the general health of the community in question. *H. Harold Scott*

Blomfield, D. **Observations upon Yaws and its Treatment in Embu District.** *East African Med. J.* 1953, Aug., v. 30, No. 8, 323–32, 1 map.

The district with which this report is concerned is on the southern slopes of Mount Kenya, East Africa. The work was started in June, 1951. The author says " yaws may remain hidden in a population who like and make habitual use of a dispensary and the actual numbers afflicted by the disease may be far greater than one is led to believe. This has been my experience for I have found yaws to be very rife in areas previously thought free of it." This, he thinks, may be due to the people having lost faith in bismuth injections.

The author rather briefly surveys the present position of yaws control and finds it unsatisfactory.

" Yaws is contracted by direct contact, most commonly it is considered, by the shared blanket. Flies are always prevalent where yaws is common and they may be seen feeding in great numbers on the exuding serum of the uncovered lesions. Too much accent appears to have been put in the past on high humidity as being a factor. Yaws is common in hot, dry and arid country. The relationship to wet weather is almost certainly allied to the children huddling for warmth in a single bed after getting soaked in the rain."

The author divides the disease into 2 forms, infectious and non-infectious. " There are many indications for the dropping of the old terminology of a disease occurring in three stages."

" . . . a clinic for the disease in a dispensary, Siakago, which serves a fairly well populated and isolated community living in a dry savannah country about the base of a group of hills to the south-east of Embu," was opened and patients seeking treatment were given penicillin. The exact type of penicillin used is not described. " That used in the latter part of this trial has the dual character of giving a high initial blood concentration together with the prolonged effect of a depot dose." The adult dose used was a single injection of 1·2 mega units. The day after treatment lesions were smoother, flatter and drier. " On the third day the lesions were in the healing stage." " At the end of four days, the marks were dry and scabbed over, the scabs being shed after a week, leaving dry greyish marks."

Of 408 patients treated only 144 returned for re-examination and only 10 were " under observation for any length of time ". " Two have returned with recrudescences. . . . This is strong evidence that relapses do not occur. Infection with yaws excites no resistance or immunity and the cases would seem to be open to prompt re-infection. The lack is probably due to the familial nature of the disease and the common occurrence of all infected members of the family being brought up at the same time. Contact with other infected children is probably not close enough for the

African who lives in groups of family communities set comparatively widely apart by the intervening fields."

"It is thought highly probable that the ineffective treatment of a few bismuth injections (for very few have more than two or three injections and no one in the reserve completes the course) is responsible for the appearance later of the crippling forms of the disease, a pointer to the fact that bismuth should be withdrawn from uncontrolled dispensary practice as it may well produce sub-clinical yaws which eventually manifests itself in the non-infectious form of the adult."

The summary ends as follows:—

"Future treatment of the disease, which may be hidden, should be by a simple routine of a single injection of a penicillin preparation having both attributes of high initial blood concentration plus slow diffusion. There are pointers indicating that, with a method that suits the type of people who are affected by yaws, the disease will disappear."

[The author makes many interesting statements for many of which, unfortunately, he produces no evidence. No figures other than those given above are reported.] *C. J. Hackett*

LEPROSY

Sagher, F., Kocsard, E. & Liban, E. **Specific Tissue Alteration in Leprous Skin. II. The Histology of the Tuberculin Reaction in Leprosy.** *J. Investigative Dermat.* 1952, Dec., v. 19, No. 6, 499–508, 8 figs. [17 refs.]

"Tuberculin tests with O.T. or PPD were performed in fourteen leprous patients with different types and stages of the disease. Eighteen biopsies of the test sites were taken 2 to 28 days after injection. In all instances nests of foam cells or granulomatous structures resembling lepromatous leprosy were found in the dermis usually surrounding blood vessels of the subpapillary layer and skin appendages.

"The conclusion was drawn that leprosy produced a profound specific alteration of the skin so that tuberculin allergen elicited a clinical and histologic response characteristic of the altered host's tissues."

Chaussinand, R., Viette, M., Dezest, G. & Krug, O. Évolution de l'infection à bacilles de Stefansky chez le rat traité par l'hydrazide de l'acide isonicotinique. [**Course of Rat Leprosy in Rats Treated with Isoniazid**] *Ann. Inst. Pasteur.* 1953, Sept., v. 85, No. 3, 398–402.

The following is a translation of the author's summary:—

Isoniazid given orally in doses of 0·75 and 1 mgm. for more than 10 months did not suppress the disease produced in rats by subcutaneous inoculation of Stefansky's bacillus. Nevertheless, the appearance of local lesions, the lymphatic spread and the visceral manifestations, although present, were always much later and the pathological changes less widespread and less intense than in the controls. On the other hand treatment with isoniazid seemed to be more effective if it was not started until 17 days after inoculation.

[For similar studies by the authors see this *Bulletin*, 1953, v. 50, 523; see also 522, 524, *bis.*] *H. J. O'D. Burke-Gaffney*

HELMINTHIASIS

Barbosa, F. S. & Dobbin, J. E., Jr. Infestação por *Schistosoma mansoni* em *A. glabratus* e na população humana de Pontezinha, Pernambuco. [**Infection of Man and of** *A. glabratus* **by** *Schistosoma mansoni* **and its Cercariae in Pontezinha**] *Publicações Avul. Inst. Aggeu Magalhães.* Recife, Brazil. 1951–52, v. 1, 125–8, 6 figs. on 3 pls. French summary.

Pontezinha is a small village in the municipality of Jaboatão, Pernambuco State, Brazil. It comprises some 200 thatched mud huts in 2 main streets. The water supply is a small brook into which the privies flow and in which the children play. On 10th May, 1951, specimens of *A. glabratus* from this brook were examined and 3·1 per cent. were found infected with cercariae of *S. mansoni*. In June, 1952, they were found in 1·6 per cent. of 180 snails examined. This brook appears to be the only source whence the children become infected, for examination of waters over a distance of several kilometres showed them all to be free from this vector.

To determine the degree of human infection the authors examined, on a single occasion only, the faeces of 107 children from 3 to 12 years of age, born in the village. The numbers at different ages were small and those infected are stated in percentages, but the results are better expressed in actual figures. Thus, of 22 samples from children 3 years old 2 were positive (stated as 9 per cent.); of 12 from the 4-year-olds 8·3 per cent. (*i.e.*, 1) were positive; in successive years after this the figures were 2 out of 16, 1 out of 8, 3 out of 13, 3 of 7, 2 of 7, 4 of 7, 4 of 7, and 6 out of 8; in other words 28 were positive among the 107 (26·2 per cent.); 20 were boys, 8 were girls; 3 were Whites, 25 were coloured. Photographs show well the terrain. *H. Harold Scott*

Barbosa, F. A. S., Dobbin, J. E., Jr. & Vieira, A. E. Inquérito preliminar sôbre infestação de planorbídeos de alguns municípios de Pernambuco. [**Infection of Planorbidae in Certain Areas of Pernambuco**] *Publicações Avul. Inst. Aggeu Magalhães.* Recife, Brazil. 1951–52, v. 1, 99–123, 5 coloured maps. English summary (5 lines).

Examination of planorbidae, *Australorbis glabratus* and *Tropicorbis centimetralis*, in 5 municipalities of Pernambuco, shows very divergent degrees of infection by cercariae of *Schistosoma mansoni*. The 5 municipalities were Recife, Olinda, Paulista, Jaboatão and São Lourenço de Mata. In Recife 224 specimens of *T. janeirensis* and 16 of *Drepanotrema cultratum*, and in São Lourenço de Mata 14 specimens of *D. anatium* were examined, but none of these was found infected by *S. mansoni* cercariae (though in 2 of the last other cercariae were present) so nothing further need be said of these. In Recife 259 specimens of *A. glabratus* were examined and 75 (28·9 per cent.) were positive, while of 2,058 *T. centimetralis* only 2 were positive (0·09). In Olinda 1,415 specimens of *A. glabratus* yielded 183 positive (12·9), but only 2 (0·64) of 312 *T. centimetralis*. In Paulista *A. glabratus* only were examined and 140 were positive among 818 (17·1); in Jaboatão 2 among 95 *A. glabratus* and 3 among 747 *T. centimetralis* were positive; in São Lourenço de Mata, of 1,228 *T. centimetralis* 3 (0·24) were positive; no *A. glabratus* was recorded here. Altogether of 2,587 *A. glabratus* 400 (15·4) and of 4,345 *T. centimetralis* 10 (0·23) were positive. [The last has been added up wrongly in the author's table, being given as 4,545

and the percentage, calculated on this figure, as 0·22.] There are 5 line maps of the districts with the infected parts shown in colour.

H. Harold Scott

Newton, W. L. **The Inheritance of Susceptibility to Infection with** *Schistosoma mansoni* **in** *Australorbis glabratus*. *Exper. Parasit.* New York. 1953, July, v. 2, No. 3, 242–57. [29 refs.]

Files [this *Bulletin*, 1952, v. 49, 780] showed that whereas *Australorbis glabratus* from Puerto Rico was susceptible to the local strain of *S. mansoni*, a morphologically identical strain of *Australorbis glabratus* from São Salvador, Brazil, was completely refractory. In order to ascertain whether these 2 strains of snails might represent 2 genetically different populations, with regard to susceptibility, crosses were made between members of the 2 strains. Since *A. glabratus* is self-fertilizing, as well as cross-fertilizing, the problem arose as to the ancestry of offsprings obtained after pairing. This difficulty was overcome by obtaining a red mutant variety of the Brazilian strain which bred true and which was refractory to infection with the Porto Rican strain of *S. mansoni*.

The author's summary is as follows:

"Studies were conducted to ascertain whether genetic factors were involved in the susceptibility difference between a Brazilian and a Puerto Rican strain of *Australorbis glabratus* to a Puerto Rican strain of *Schistosoma mansoni*.

"Since it was found that non-genetic factors such as the number of miracidia used for exposure and the size and age of the snails exerted some influence upon susceptibility and infection rate, a standard set of exposure conditions was used. Under these conditions 95% of the Puerto Rican snails were positive for cercariae after 30 to 32 days, whereas none of the Brazilian snails became infected.

"Crosses were made between members of the two snail strains, and the progeny therefrom were exposed to infection under the conditions mentioned above. Because *A. glabratus* can self- as well as cross-fertilize, a red mutant variety of the Brazilian strain which was recessive to the wild-type pigmented condition was used as a member of a pair to ascertain when crossing had occurred.

"F_1 progeny from some Brazilian parents which had crossed with Puerto Rican snails included susceptibles; F_1's from other crosses did not. F_2 populations derived from selfed nonsusceptible F_1's had infection rates which showed a continuous type of distribution from 3 to 58%. The red members of the F_2 populations showed a slightly, but significantly, higher infection rate than did the pigmented members. F_3 populations derived from nonsusceptible F_2 parents had infection rates varying from 0 to 82%. Particular infection rates were replicated in several of the populations.

"The findings demonstrated that susceptibility to *S. mansoni* infection in *A. glabratus* is a heritable character, and that several genetic factors are probably involved. The Puerto Rican and Brazilian strains of *A. glabratus* used in these studies apparently represent different genetic populations with regard to this character, at least insofar as the Puerto Rican strain of parasite is concerned."

[This important paper furnishes further evidence that it is unwise to announce that a particular species of mollusc is insusceptible to infection with a particular species of schistosome, until a wide variety of strains of both mollusc and helminth have been mutually exposed. Furthermore, the

results obtained emphasize the dangers which may arise as a result of the introduction of new strains of parasites or new strains of molluscs or both.]

R. M. Gordon

Olivier, L., von Brand, T. & Mehlman, B. **The Influence of Lack of Oxygen on *Schistosoma mansoni* Cercariae and on Infected *Australorbis glabratus*.** *Exper. Parasit.* New York. 1953, July, v. 2, No. 3, 258–70. [13 refs.]

The authors point out that no previous study has been published concerning the possible influence of trematode infections on the anaerobic metabolism of snails, nor on the effect of oxygen deprivation on the viability of the cercariae while in the snail host and after their discharge from the mollusc. Nevertheless, such studies may prove of practical importance since infected snails may be found in anaerobic—or almost anaerobic conditions—in stagnant pools or in the mud at the bottom of such pools. Under these conditions it is clear that the lack of oxygen changes not only the conditions under which the snails themselves metabolize but also those under which the cercariae live.

"Anaerobic studies were made both on the cercariae of *Schistosoma mansoni* and on *Australorbis glabratus* infected with that parasite.

"Although infected snails withstood 6 hours under anaerobic conditions most of them died when kept anaerobically for 16 hours, indicating that the presence of the infection makes them more susceptible to damage from lack of oxygen than uninfected snails.

"Shed of cercariae from infected snails was greatly reduced under anaerobic conditions and most freshly shed cercariae died rapidly when deprived of oxygen. Nevertheless, snails held anaerobically for 6, and even 16 hours shed normal cercariae when returned to an aerobic environment indicating that, although the free cercariae cannot survive without oxygen, those in the snail can. Cercariae shed by snails after they had been kept anaerobically for 4 hours were as infective for mice as were cercariae from normal snails.

"Five per cent of oxygen in the environment permitted normal shed and survival of cercariae. On the other hand, at 0·7% oxygen the shed of cercariae was greatly reduced but freshly shed cercariae were not damaged.

"Infected snails stored less polysaccharide than uninfected ones. In anaerobic experiments, the molar ratio between polysaccharide consumed and carbon dioxide and volatile acids produced differed from that observed in uninfected snails. The anaerobic metabolic level of both infected and uninfected snails of the Dominican strain was higher than that of snails of the Puerto Rican strain."

R. M. Gordon

Coelho, B. Morfogênese das lesões hepáticas na esquistosomose mansônica experimental. [**Hepatic Lesions in Experimental Infection by *Schistosoma mansoni***] *Publicações Avul. Inst. Aggeu Magalhães.* Recife, Brazil. 1951–52, v. 1, 61–97, 24 figs. on 12 pls. [25 refs.] English summary.

In this long article the author describes in minute detail the effects of experimental infection of guineapigs, rats and rabbits by cercariae of *S. mansoni*. Thirty-nine guineapigs, 19 white rats and 8 rabbits were infected and at various periods thereafter, ranging from 50 to 190 days, they were given injections of sodium antimony tartrate and at intervals from 6 days to 8

weeks after treatment animals were killed and their livers examined by stained sections. Study of the 24 excellent photomicrographs will save pages of verbal description; for the finer details of the morbid histology, those interested should consult the original. The changes can, however, be summed up fairly briefly. The important point is that the lesions found differ considerably from those recorded in human infections. The basic change is vascular from invasion of the portal venules and the other changes are dependent on these. The lesions in the early stages are purely congestive and as a result there is a certain atrophy of the adjacent cells of the parenchyma. In those animals allowed to live longer the presence of worms and ova causes areas of ischaemia alternating with those of congestion and, by migration, the worms dilate the vessels, compress the adjacent tissue, and cause a temporary sinus ischaemia, but unless they die and remain do not give rise to much change in the liver tissue and the circulation is soon re-established. There was no indication of the cirrhosis found in human infections, nor degenerative changes ascribable to helminthic toxins. Such changes were observed only when dead worms were present. In short, the treatment, by killing the worms, is responsible for the degenerative changes set up in the liver parenchyma. In the words of the author: " A large number of dead worms are carried by the portal blood stream to the hepatic vascular tree, where they remain. This leads to autolysis of worm bodies in the liver which gives origin to several lesions like necrosis, embolism, thrombosis, extensive inflammatory changes, endophlebitis, obstructions of the blood stream and their consequences."

H. Harold Scott

Lurie, H. I., de Meillon, B. & Stoffberg, N. **Experimental Bilharziasis in Animals. I. Early Diagnosis of Bilharziasis.** *South African Med. J.* 1952, Dec. 20, v. 26, No. 51, 1005–8, 1 fig.

" 1. In monkeys experimentally infected with *B. mansoni* and *B. ? bovis* the positive signs of infection appear in the following order and intervals after exposure respectively—complement fixation 3 weeks, eosinophilia 6 weeks, and ova in faeces 8 weeks.

" 2. The complement fixation test remains positive throughout infection (longest period 9 months). The eosinophil count shows a steep rise starting after about 6 weeks and reaching its maximum by the end of the 8th week. Thereafter it falls rapidly until by the end of the 12th week it has returned to normal or near normal.

" 3. Monkeys infected with cercariae derived from a single miracidium behave exactly as do those with bisexual infections. Thus eosinophilia may result from infestation in the absence of eggs.

" 4. Of 31 monkeys 2 showed no eosinophilia during 3 months' observation and in 3 human cases only one developed an eosinophilia; therefore eosinophilia is not constantly present in the early stages of bilharziasis.

" 5. In 3 human cases in which the date of infection was accurately known the sequence of events with regard to the complement fixation and eosinophilia exactly paralleled the work with monkeys.

" 6. Skin reactions did not occur in our monkeys but in the 3 human cases the first positive reaction—a doubtful one—appeared in the 5th week after infection.

" 7. It is concluded that under experimental conditions the first and most reliable sign of bilharziasis is a positive complement fixation which functions both in unisexual and bisexual infections."

Schwetz, J. **On a New Schistosome of Wild Rodents found in the Belgian Congo,** *Schistosoma mansoni* **var.** *rodentorum* **var. nov.** *Ann. Trop. Med. & Parasit.* 1953, June, v. 47, No. 2, 183–6, 12 figs. on 2 pls. & 1 map.

The author briefly summarizes his earlier work on *Schistosoma rodhaini*, a species parasitic in mice that is distinguishable from *S. mansoni* only by the characteristics of its eggs. This species was found by the author and his collaborators in the Elisabethville area of the Belgian Congo and also at Sakania and Albertville. Further investigation of it has now led to the discovery of a second and new species, named by the author *S. mansoni* var. *rodentorum* [*sic*].

The author describes the eggs of this new species found in the liver, faeces and scrapings of the intestinal mucosa of wild rodents and he gives microphotographs of them. The eggs are usually elongated and slightly twisted, one end being rounded and the other narrowed. The lateral spine is inserted near, or very near, to the rounded end. The notch between the base of the spine and the body of the egg is very obvious and may be very deep. The adults of this species are identical with those of *S. mansoni*, as the adults of *S. rodhaini* also are. Infections of wild rodents with this new species are, unlike those with *S. rodhaini*, extremely rare and usually very light, at any rate in the Albertville area. Out of 471 rodents captured, only 18 (4 per cent.) were infected with this new species, whereas *S. rodhaini* was found in 24 out of 85 rodents (30 per cent.). The eggs of the new species were found primarily in the liver, where, in one exceptional case, 2 male adult worms were found. Adult worms were found only twice in the mesenteric veins. The infections of rodents were mild and chronic and resembled human infections which remain unsuspected during the infected person's lifetime. The author is investigating the questions whether this new species may be able to parasitize man and whether it is a true morphological and biological variety of *S. mansoni*. *G. Lapage*

Barbosa, F. S., de Moraes, J. G., Calado, O. B. & de Almeida, A. M. Ação moluscacida sinérgica da saponina de *Sapindus saponaria* e pentaclorofenato de sódio. [**Sodium Pentachlorophenate combined with Saponin from** *Sapindus saponaria* **as a Molluscicide**] *Publicações Avul. Inst. Aggeu Magalhães.* Recife, Brazil. 1951–52, v. 1, 129–39. French summary.

In 1942 Viana Martins studied the action of *Sapindus saponaria* on *Australorbis glabratus* and his work was followed up by those of Pinto and Almeida (*Mem. Inst. Osw. Cruz*, 1944, v. 40, 291–310) on the same lines, and in 1946 Luttermoser [this *Bulletin*, 1947, v. 44, 1078] reported on this and other plants growing in Venezuela as regards their action on *A. glabratus*. The criterion aimed at by the present authors is the death of all the snails within 24 hours. A series of tables show the results of sodium pentachlorophenate alone and of combinations of it with *Sapindus saponaria* (the fruits dried and triturated) in varied proportions in laboratory-bred snails, after 12 and after 24 hours' contact. These results may be summed up by saying, as the authors state in general terms, that the mixture "has some value, but not very great." According to these tables the most satisfactory appears to be a mixture of 60 p.p.m. of the plant with 4 p.p.m. of the pentachlorophenate and contact up to 12 hours. [See also this *Bulletin*, 1950, v. 47, 143; 1951, v. 48, 53.]

H. Harold Scott

Dobrovolny, C. G. & Haskins, W. T. **Effects of Soils and Sunlight on Dilute Concentrations of Sodium Pentachlorophenate.** *Science.* 1953, May 8, v. 117, 501–2.

In testing potential molluscicides against the intermediate hosts of *S. mansoni* in Brazil, it was noted that snail mortality was lower where the test areas had muddy bottoms and that, in fact, in the case of the pentachlorophenate group, concentrations decreased most rapidly in such plots having a bottom layer of soft mud. Laboratory experiments were therefore designed in which different types of water-saturated soil from infected waters were tested against 10 p.p.m. sodium pentachlorophenate for periods up to 30 days. Details are given in the paper and the results shown in a table which indicates, in general, that the concentrations of sodium pentachlorophenate were reduced to 5 p.p.m. or less in 3 or 4 days in the presence of the mud, and in half of the 8 samples the chemical had disappeared altogether in about a fortnight. The greater the relative depth of mud in the water, the more rapid was the decrease. In 2 samples where the mud was disturbed or stirred, the chemical disappeared rapidly, and in one of these only a trace was present after 4 hours. In 2 other experiments with sandy loam and sand—and relatively less organic matter and clay—reduction of concentration was much slower: generally, an increased residual effect of the chemicals was found in waters with sandy beds. The control solution of 10 p.p.m. pentachlorophenate remained unchanged in concentration throughout.

In similar experimental conditions it was found that exposure to direct sunlight at temperatures not exceeding 38°C. for 8 hours reduced the concentration of the chemical from 10 p.p.m. to 1 or 0 p.p.m., not only in soil samples, but in clear solution: after such an exposure to sunlight, the preparations were only 0–20 per cent. effective against *Australorbis glabratus* within 24 hours.

It is suggested that mud and sunlight may be important factors in reducing the efficacy of some molluscicides under field conditions; while the sunlight may be important in shallow open waters, it is in practice probably less of a factor than mud in reducing the chemical concentrations, since most of the waters concerned are shaded by vegetation and high banks. Allowance for loss of concentration should, however, be made when these chemicals are applied in muddy water: the unfavourable effect may be reduced by applying the chemicals when the water is clear and the mud is not disturbed. *H. J. O'D. Burke-Gaffney*

Perlowagora-Szumlewicz, Alina & de Aguiar, Hilda A. Experiências de laboratório sôbre a ação planorbicida do breu. [**Rosin Soap as a Planorbicide**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 371–4. English summary.

Gammexane is a good molluscicide, but not good enough to kill off all snails in, say, 72 hours in concentrations up to 10 p.p.m. A mixture of BHC, benzene, rosin soap and water forms a stable emulsion in water. Details of the method of preparation are given in the paper. The effect of different concentrations varies; thus, at 10–15 p.p.m. there is a knock-down effect, the snails are motionless, but after a time they seem to recover, drag themselves up the side of the containing vessel and hang on there till they drop and die in 24–48 hours. In higher concentrations, over 30 p.p.m., the snails withdraw into their shells and remain motionless, but later recover if washed and placed in fresh water. A concentration

of at least 10 p.p.m. is needed to destroy the snails in 48 hours; at 15 p.p.m. 57 per cent. died in 24 hours, 87 per cent. in 28 hours, and all in 30 hours. At as high a concentration as 150 p.p.m. all were killed in 10 hours, but after 6 hours only 40 per cent. These experiments were carried out in the laboratory; the results under natural conditions have not yet been tried. *H. Harold Scott*

See also p. 13, Alves and Blair, **An Experiment in the Control of Malaria and Bilharziasis.**

Deramee, O., Thienpont, D., Fain, A. & Jadin, J. Sur un foyer de Bilharziose canine à *Schistosoma rodhaini* Brumpt au Ruanda-Urundi. Note preliminaire. [**A Focus of Canine Schistosomiasis due to** *S. rodhaini* **in Ruanda Urundi**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 207–9.

The authors found *S. rodhaini* in the stools of 16 of 29 dogs examined in 1952–1953 at Musha, 40 km. from Astrida in Ruanda Urundi at an altitude of 1,500 metres. The parasite was also found in a single serval [*Felis* (*Leptailurus*) *serval*] in another area at the same altitude. The schistosomes were not found in animals at higher altitudes. Many of the canine infections were massive, with severe clinical manifestations and certain histological changes [which will be reported later]. The infection in the serval was light. Both animals are new hosts for *S. rodhaini*. The virulence of the parasite for dogs is noted. *H. J. O'D. Burke-Gaffney*

Pesigan, T. P. **The Schistosomiasis Problem in the Philippines: its Public Health and other Aspects.** Reprinted from *Santo Tomas J. of Med.* Manila. 1953, Jan.–Feb., v. 8, No. 1, 1–22, 8 pls. (1 folding).

This paper provides a general review of the problem of *Schistosoma japonicum* in the Philippines. In the period 1949–51 a survey of the human and snail populations was carried out, which revealed nearly 11,000 infected persons among some 123,000 examined and the presence of the snail vector, *Oncomelania quadrasi*, around the 61 towns in which the disease was endemic. It is calculated that between 200,000 and 300,000 persons are infected, more than half of them in Eastern Leyte and Samar, the rest in Sorsogon, Mindoro and in 8 of the 9 provinces of Mindanao. In all the endemic centres a distinct dry season is lacking, the rainfall being evenly distributed throughout the year, with at least 4 inches a month and on 8 or more days a month. Infection was diagnosed by demonstration of ova in early cases and in late cases by rectal biopsy and by skin and serological tests. Treatment was given only after the persons affected had constructed a latrine. Tartar emetic, a total course of 0·567 gm. in 15 doses on alternate days, required the hospitalization of the patient and gave 16 per cent. relapses. Fuadin, 10 injections, later increased to 14 or 15, was given to out-patients but it was followed by a 70 per cent. relapse rate and often the course was not completed. The prognosis was poor unless treatment was given before fibrosis of the liver occurred and unless the patient was removed from the endemic area, since reinfection was the rule.

Oncomelania quadrasi live in the low, flat plains and valleys suitable for lowland farming, but they have also been discovered thriving in forest. They require shade, moisture, decaying vegetable matter and a fluctuating

water level. In intensively farmed areas they occur only in small pockets along the edges of rice fields, along the canals and in places left unplanted and covered with thick grass or bushes. Sunlight and disturbance of the habitat are inimical to these snails. The dinitro compounds and sodium pentachlorophenate are effective molluscicides but are too costly for widespread use. Recommendations made for the control of schistosomiasis include the intensification of agriculture (cropping twice a year reduces snail numbers and drives them into small pockets), the reclamation and use of marshy agricultural land, the construction of roads to the remotest smallholdings and the building of bridges over streams. These measures would attack the snail directly and would improve socio-economic conditions. Splenectomy in late-stage cases with bleeding from varices has been encouraging and further investigation of surgical methods of treating portal hypertension is advocated. The paper is illustrated with maps showing the exact distribution of the disease. [See also this *Bulletin*, 1951, v. 48, 274; 1952, v. 49, 975.] *T. H. Davey*

Yokogawa, M. **Studies on the Biological Aspects of the Larval Stages of *Paragonimus westermanii*, especially the Invasion of the Second Intermediate Hosts. (I).** *Japanese J. Med. Sci. & Biol.* 1952, Aug., v. 5, No. 4, 221–37, 1 fig. [31 refs.]

Snail surveys in localities in Shizuoka and Ehime Prefectures, Japan, revealed, in the former, an infection rate of 2·8 per cent. with *Paragonimus westermani* in 6,574 snails (*Semisulcospira libertina*) examined. In one village of Ehime Prefecture, a new snail host was found, namely *Semisulcospira japonica* which is a variety of *S. libertina*. Of 546 examined one was found infected. Seasonal incidence of the snail infection, which was observed over a period of about 12 months, was not found to be marked. A correlation was noted between the size of the snails and the incidence of infection, a higher incidence occurring in the larger snails.

Observations were made on the shedding of cercariae from infected snails and resulted in the conclusion that cercariae are rarely shed under natural conditions. The great majority of them appear to be retained in the body of the snail. Light and temperature had little effect on the shedding.

Experiments with naturally shed cercariae and cercariae freed by crushing the snails showed no differences in morphology or behaviour of the two kinds. Other experiments revealed no evidence as to how the crab hosts (*Potamon dehaani*) become infected. *J. J. C. Buckley*

Roque, F. T., Ludwick, R. W. & Bell, J. C. **Pulmonary Paragonimiasis: a Review with Case Reports from Korea and the Philippines.** *Ann. Intern. Med.* 1953, June, v. 38, No. 6, 1206–21, 11 figs. [11 refs.]

The authors review this subject under the headings: life history, pathogenesis, clinical features, radiographic findings, course, complications and treatment. Their work was almost entirely clinical. They conclude that haemoptysis in a patient who has been in an area in which paragonimiasis is endemic should suggest the possibility of infection and they expect that the infection will be found among Americans who have been in endemic areas. Usually the infection is acquired by eating raw or poorly cooked freshwater crustaceans (such as crabs or crayfish), but the necessity for the crustacean intermediate host has been questioned and Ameel [this *Bulletin*, 1934, v. 31, 771] claims to have transmitted the fluke from one animal to

another without any intermediate host. The authors' experience indicated that infection can occur through contaminated drinking water. [See also Komiya *et al.*, this *Bulletin*, 1953, v. 50, 633.] Infected patients usually show haemoptysis, operculated eggs of the fluke in the sputum and a positive radiogram of the chest. The X-ray findings may closely simulate those of pulmonary tuberculosis. The authors doubt whether the fluke causes the caseation-necrosis or lesions resembling tuberculous lesions which may be found. It is doubtful whether eosinophilia is characteristic of the disease.

G. Lapage

Garipuy, A., Daste, B., Couzi, G. & Mallaret, P. Distomatose duodénale à *Fasciola hepatica*. [*Fasciola hepatica* **Infection**] *Maroc. Méd.* 1953, June, v. 32, No. 337, 614–16, 1 fig.

A case in Morocco.

Schoen, R. & Schneider, H. H. Lässt sich die Bandwurmkur gefahrlos gestalten? [**Can Treatment of Tapeworm Infections be Harmless?**] *Deut. med. Woch.* 1953, July 31, v. 78, Nos. 31/32, 1057–9.

The authors describe in some detail the circumstances which led to the deaths of 2 male patients after treatment for tapeworm infections which were not accurately diagnosed. The first patient was given 10 gm. of Filmaron [a preparation of *Filix mas*] by duodenal sound and, two hours later, 15 cc. of oil of chenopodium. The second was given, soon after one treatment with Filmaron had failed, another treatment with it combined with chloroform, 50 cc. of which were given in error instead of the 5 cc. ordered. The authors remark that Filmaron is doubtless an improvement on extract of *Filix mas*. Its toxicity is low if it is quickly eliminated again by a purgative, but a dose of 8 gm. must not be exceeded. The drug should not be given to weakly patients or to patients with inflammatory conditions of the alimentary canal, because absorption through the lesions present may then occur; and it should not be soon repeated after a previous dose. It should not be combined with other remedies and oil of chenopodium, which is, in any event, not active against tapeworms, greatly increases the toxicity of Filmaron and accelerates its absorption and it may damage the liver. The old folk-remedies are not active and cannot be given in exact doses.

The authors first tried to replace Filmaron with benzine [petroleum benzine], recommended by Biyal [this *Bulletin*, 1948, v. 45, 802]. [See also Wigand and Warnecke, this *Bulletin*, 1953, v. 50, 959.] Though this drug was given by duodenal sound, the results were worse than those obtained by the authors when they treated infections with *Taenia saginata* and *T. solium* with *Filix mas* or Filmaron. They obtained better results with acridine dyes, especially with atebrin [mepacrine]. Hornbostel and Dörken [this *Bulletin*, 1952, v. 49, 703] showed the efficacy of atebrin for tapeworm infections and giardiasis. It is best to give it through a 70 cm. sound lying below the pylorus and doses of 0·6 to 1 gm. of it have low toxicity. It may cause vomiting, especially in women and sensitive men, and this must be avoided, because of the danger of bringing up the eggs and, with *T. solium* infections, the risk of cysticercosis.

The authors gave 0·7 to 0·8 gm. of atebrin through a duodenal sound. These doses are below the toxic level. Moeschlin (*Klinik und Therapie der Vergiftungen*, 1952, Stuttgart) described the toxic effects of atebrin. To avoid vomiting the present authors recommend luminal or atropine.

These doses of atebrin gave much better results than *Filix mas* or Filmaron

or petroleum benzine. Out of 8 cases they removed the heads of the worms in 6. In 2 cases the heads were not found. Hornbostel and Dörken (*loc. cit.*) obtained successful results in all of 20 cases. One of the typical cases treated by the authors was a student aged 27 years, infected with *T. saginata*. He was given 0·8 gm. atebrin in 100 cc. water by duodenal sound and half an hour later, " 20·0 " of magnesium sulphate as a purgative, this being also given through the sound, which was left in place meanwhile. Half an hour later he expelled a worm 6 metres long with its head. There were no toxic effects.

Acranil is, the authors say, equally valuable, doses of 0·8 gm. being given to adults through a duodenal sound, in order to concentrate the drug at the site of the worm. Oral dosing will not achieve this. The purgative is as important as the method of giving the acridine derivative. It is best given through the sound, which is left in place until it is given, and plenty of water to ensure rapid evacuation of the intestinal contents. *G. Lapage*

Sweatman, G. K. **Distribution and Incidence of *Echinococcus granulosus* in Man and other Animals with special reference to Canada.** *Canadian J. Pub. Health.* 1952, Nov., v. 43, No. 11, 480–86, 2 figs. [59 refs.]

Moose (*Alces americana*) and wolf (*Canis lupus*) are the important reservoir hosts of *Echinococcus granulosus* in North America; of 29 moose 17, and of 58 wolves 36 were found infected. Other hosts of this parasite, definitive and intermediate, are listed from published and unpublished works and their distribution is illustrated by a map. They include dog, wolf, coyote, fox, fisher [a marten], man, pig, horse, cow, cat, moose, deer, wapiti, caribou, reindeer, bison and vole. " The human cases reported by Magath (1950) [this *Bulletin*, 1951, v. 48, 1023] in Canada occurred for the most part in immigrants who probably acquired their infection outside the country. More recently, as facilities for making chest X-rays have become available to people living in northern areas, an increase has been noted in the number of cases among native Canadians." Twenty-one unpublished human case histories are referred to and 13 of these are recorded on the map as being of indigenous origin. In human infections the site of encystment is most frequently in the liver whereas in wild herbivores and domestic animals the lung is most often involved.

The wide and overlapping distribution of moose and wolves implies a widespread distribution of *E. granulosus* in this region and there is risk of infection to dogs in the vicinity of hunting lodges. Although the evidence points to a relatively low infection rate in domestic stock, *i.e.*, cattle, horses and swine, it is believed that unless precautions are taken, there may be an increase of hydatid disease resulting from increased contacts between man, dogs and infected wild animals. *J. J. C. Buckley*

Trincão, C., Gouvéia, E., Parreira, F. & Franco, A. Les variations du cuivre et du zinc sanguins au cours des hypersidérémies provoquées dans l'ankylostomiase. [**Variations in the Copper and Zinc in Presence of High Iron Values in the Blood of Ankylostomiasis Patients**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 434–40, 6 graphs. [10 refs.]

In this study on 17 ankylostomiasis patients in Portuguese Guinea iron was administered to 8 orally and to 9 parenterally. Determinations of iron, copper and zinc were made on the blood 2, 4 and 6 hours after the administration.

With oral administration the results confirm in general those of Larizza and Ventura (*L'Anemia da Anchilostoma*, ed. Tipografia del Libro, Pavia, 1950). A relationship was evident between the highest figures for blood-iron and the lowest for blood-copper. After dosage by the oral route the variations in blood-copper were less constant than after intravenous iron injection. The results are tabulated and illustrated by graphs.

J. H. Birkinshaw

Trincão, C., Gouvéia, E., Parreira, F. & Franco, A. La dysprotidémie dans l'ankylostomiase. [**Changes in Blood Protein in Ankylostomiasis**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 440–45, 1 fig.

The blood protein of 15 Africans in Portuguese Guinea suffering from ankylostomiasis was examined by several methods. No lowering of the total protein due to the disease was observed. There were 10 cases of lowered albumin (considering relative, not absolute values), α-globulin was also lower except in 3 cases. β-Globulin was normal in 7 cases and diminished in 8, γ-globulin was at least 50 per cent. higher than normal in all cases. The colloidal lability of the serum was increased in some cases, but could not be correlated with the variation in distribution of the serum proteins. There was some relation between the increase in speed of sedimentation and the higher γ-globulin values.

J. H. Birkinshaw

Watson, J. M. **Human Trichostrongylosis and its Relationship to Ancylostomiasis in Southern Iraq, with Comments on World Incidence.** *Parasitology.* 1953, May, v. 43, Nos. 1/2, 102–9, 3 figs. [33 refs.]

The author quotes Stoll [this *Bulletin*, 1947, v. 44, 667] as having estimated that 5·5 million human beings suffer from infection with *Trichostrongylus*; he raises this estimate to 58 millions on the grounds of his own experience and that of others, since 1947.

The investigations that the author reports were made in Iraq. The highest incidence was in Basrah where he found 25·4 per cent. of 335 persons infected. "The incidence decreases northwards from Abadan past Basrah up the course of the Shatt-al-Arab estuary. Along the humid and palm-fringed banks of the Euphrates upstream from its confluence with the Tigris at Qurnah the incidence continued to fall but less rapidly than along the more arid banks of the Tigris (see Table 1, Figs. 2 and 3). No indigenous cases were found above Kurmah on the Euphrates or above Amarah on the Tigris."

The figure of 1 per cent. of 1,071 which was found in Baghdad he attributes to immigrants from the south.

The distribution was strictly correlated with the local climatic conditions. High humidity with abundant shade and the presence of grass and other carpet vegetation is necessary for the extra-corporeal development of this worm. For example, in Basrah, where the incidence is high, the mean monthly relative humidity never drops below 45 per cent.: in Baghdad, during the hottest months, the relative humidity is well below 40 per cent.

The hookworm incidence appeared to rise as that of *Trichostrongylus* fell, but this was probably a coincidence since the hookworm flourishes in a much wider range of temperatures and humidities than the latter worm, and is dependent within this range on other environmental and personal factors, *e.g.*, the relatively low incidence among oil refinery workers at Abadan was probably due to their wearing shoes.

The species that occurs in Iraq is probably *Trichostrongylus colubriformis*, which is common in sheep. The infection is presumably acquired by ingestion of contaminated greenstuffs. *L. E. Napier*

Jonxis, J. H. P. & Bekius, H. **The Treatment of *Ascaris* Infection with Velardon.** *Arch. Dis. in Childhood.* 1953, Aug., v. 28, No. 140, 329–31.

The authors briefly comment on the high incidence of ascariasis, on the symptoms caused by the worms and on the control of the infection. A single course of treatment is often not enough, because the migrating larvae are not affected by it and they develop into mature worms in about 3 or 4 weeks. Oil of chenopodium is the best anthelmintic, but it is so toxic that it cannot be repeated at short intervals and it is not suitable for the mass treatment required. Santonin is less toxic, but it is far less effective. Hexylresorcinol is very active and it is less toxic than santonin and oil of chenopodium, but it may damage the mucosa of the mouth and oesophagus and it must be given in capsules and is therefore not suitable for children.

Papain, the dried latex of the unripe fruit of *Carica papaya*, contains a strongly proteolytic enzyme. It is available in the form of Velardon, which is issued " in packages of 20 g. granules containing 10 g. papain activated with 0·5 g. of cysteine ", the papain being standardized by the method of Balls and Hoover (*J. Biol. Chem.*, 1937, 121, 737). The authors found that, when living *Ascaris* were placed in 50 ml. of suspensions of papain in concentrations of 0·25, 0·5, 1·0 and 2·0 per cent., the ferment first kills the worms and then dissolves them.

The authors tested Velardon by treating with it 20 children, all under 8 years old. The children were first given infusion of senna to reduce the amount of the intestinal contents and the next morning the fasting patients were given " 20 g. granules containing an activated papain preparation ". If all this could not be taken at once, it was taken in portions during the next hour. No food was given for the next 4 or 5 hours. Better results were obtained when no laxative was given afterwards, because this lowers the concentration of the ferment in the gut and will reduce the time during which the ferment is in contact with the worms. If no laxative is given no dead worms will be found in the faeces, although damaged eggs may be found.

After one course of this treatment no eggs of *Ascaris* were found in the faeces of 15 of the 20 children treated. To make sure that no worms remained, oil of chenopodium was given after the papain and, in all except 5 of the patients, no more worms were thus expelled. These 5 were all heavily infected and from them the chenopodium expelled 50, 6, 21, 45 and 56 worms respectively. In 2 of these cases eggs of *Ascaris* were still present in the faeces after the oil of chenopodium, but repetition of the Velardon caused their disappearance. In one case repetition of Velardon after the chenopodium had to be followed by repetition of the chenopodium, and another 20 worms were then removed; but a third course of Velardon was still required.

The authors claim that their results show that many moderately infected patients may be cured by a single treatment with Velardon, but, when the worms are very numerous, this may fail to remove them all. Velardon is very suitable for repeated administration because of its low toxicity. The disintegration of the worms caused by it did not lead to toxic effects of products of the worms. The authors suggest that Velardon may be effective against *Enterobius*. *G. Lapage*

Deane, L. M. & Damasceno, R. G. A filariose bancroftiana em Belém, Pará, segundo inquérito realizado em 1951. [*Wuchereria bancrofti* **Infection in Belém, Pará, in 1951**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, Oct., v. 4, No. 4, 333–46. [12 refs.] English summary.

This article is of special interest because it not only gives details of the investigation carried out in 1951, but refers also to the findings of a similar investigation 10 years ago. The authors studied the degree of infection of a cross-section of the population, the density of the vector, *Culex fatigans*, and the proportion of the latter found infected by larvae. They also calculated the " microfilarial index ", by dividing the total number of filarial embryos seen in the blood-smears by the number of persons found positive. Houses were visited between 7 and 11 p.m., blood samples, 20 cmm., taken from all living in them, thick smears were made, dehaemoglobinized, stained by Giemsa and examined next day.

The district was divided into 10 areas and altogether 8,529 persons were examined; 837 (9·8 per cent.) had microfilariae in their blood. Infection varied considerably as regards district; the Central had only 29 positive among 1,082 examined (2·7) whereas in Guamá-Cañudos there were 141 positive among 974 (14·5). Up to the age of 20 years sex showed little difference but above that age male positives preponderated. Thus, between 20 and 39 years, of 1,398 males 179 (12·8) were positive, but of 1,396 females only 137 (9·8); of 652 males between 40 and 59 years 109 (16·7), of 656 females, 71 (10·8); of 189 males over this age 32 (16·9), of 188 females 23 (12·2) were positive. Race played a large part in incidence; of 3,441 white persons examined 255 (7·4) were positive; of 4,626 half-castes 494 (10·7); of 462 Negroes 88 (19). In 1942–43, of 5,000 examined 541 were positive (10·8), a proportion very near the 837 among 8,529 (9·8) of the present investigation.

Houses examined for mosquitoes numbered 1,070 and *C. fatigans* was found in 928 (86·7 per cent.); altogether 11,487 were captured, an average of 10·7 per house; of the total, 9,592 were females and only 1,895 (16·5) were males; 2,418 were examined for filarial larvae and 156 (6·4) were infected.

Control measures comprise the spraying of houses with BHC and the treatment of infected persons with diethylcarbamazine. In addition, the authors recommend yearly determination of the degree of infestation of houses by the mosquito, and of the degree of infection of the mosquitoes by filarial larvae and, 5-yearly, an estimation of human infection, especially among young children. *H. Harold Scott*

Deane, L. M., da Rosa, D., Rachou, R. G., Martins, Josélia S., Costa, A., Gomes, Helena M. & de Carvalho, M. E. A filariose bancroftiana em Maceió, Alagoas: resultado de um inquérito realizado em 1952. [*Wuchereria bancrofti* **Infection in Maceió State, Alagoas in 1952**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, Jan., v. 5, No. 1, 17–22. English summary.

This investigation was carried out on the same lines as that by Deane and Damasceno in Belém [see above]. Maceió is, at all events was, thought to be an important focus of infection by *W. bancrofti* in Brazil but the authors' investigations carried out last year do not lend support to this. They examined a cross-section of the population of the State; in the 1950 census this was 102,301, and they examined the blood of 6,052

(just on 6 per cent.). Only 18 were found positive for microfilariae and 11 of these came from the Farol district, one of the 11 into which the State is divided; in 2 districts only a single one was found, in one 2, in another 3; 6 had none positive. Six of the patients were between 40 and 60 years of age, 5 between 10 and 20, 4 between 20 and 40, 2 under 4 years and one between 5 and 10 years; 10 were males, 8 were females; 6 were white persons, 9 were half-castes and 3 were Negroes. Mosquitoes were looked for in 1,711 houses and *C. fatigans* was found in 897. Altogether 6,839 mosquitoes were captured and 6,807 (99·5 per cent.) were *C. fatigans*. The remaining 32 included 17 other species of *Culex*, 8 *Aëdes taeniorhynchus*, 1 other *Aëdes*, 1 *Psorophora* and 5 *Anopheles tarsimaculatus* (*aquasalis*). Of those captured 4,975 were dissected, but filarial larvae were found in 5 only, 3 of them from the Farol district. The authors cannot understand why Maceió has gained its bad reputation for filariasis, but they mention that Berredo Coqueiro in 1922 reported that the filarial index was 46·5 per cent.

H. Harold Scott

de Azevedo, R. & Dobbin, J. E., Jr. Filariose (*Wuchereria bancrofti*) no grupo residencial do IAPB no Bairro dos Afogados (Recife). [**Filariasis due to *W. bancrofti* in a Residential Group in a District of Afogados, Recife, Brazil**] *Publicações Avul. Inst. Aggeu Magalhães.* Recife, Brazil. 1951–52, v. 1, 157–62. [17 refs.]

The following is a translation of the author's summary:—

A survery of filariasis was made in a group of dwellings in a district of Afogados, Recife. *W. bancrofti* was found in 9·7 per cent. of those examined [450].

The examinations were made between 10 p.m. and midnight. Thick blood films were used. *Mansonella ozzardi* was not found.

H. J. O'D. Burke-Gaffney

Charles, L. J. **A Field Experiment in Residual Control of the Adults of *Culex fatigans* in British Guiana.** *Ann. Trop. Med. & Parasit.* 1953, June, v. 47, No. 2, 113–25, 2 text figs. & 4 figs. on pl.

In British Guiana the application of residual insecticides to dwellings had a dramatic effect on the incidence of malaria because of the house-frequenting habits of the vector, *Anopheles darlingi*. Experience of the method soon showed that *Culex fatigans* was not by any means so susceptible and remains an important house-frequenting vector of disease, *viz.*, filariasis due to *Wuchereria bancrofti*. Another important feature is the possible adverse influence on public opinion of this persistence of *C. fatigans* in relation to the smooth operation of an established programme for the control of malaria and yellow fever based entirely on residual DDT application.

In the experimental area the predominant production foci of *C. fatigans* are ground waters, particularly water-logged latrines, as distinct from artificial containers; heavy rainfall is followed by high density of these mosquitoes.

The field experiment reported in this paper aimed at a determination of the value of 3 residual insecticides in various formulations. The technique employed is fully described. Pre-spraying densities of mosquitoes were obtained by Flit catches; the various groups of houses were then sprayed with the various formulations of insecticide; morning Flit catches were resumed on the eighth day after spraying, continued weekly for 16 weeks and then at 4-week intervals to complete one year's observations.

All the insecticide formulations tested produced an appreciable reduction in adult *C. fatigans* for a period up to 10 weeks. After DDT-kerosene and DDT wettable powder the reduction was most marked for the first 2 weeks and for the first week respectively; in the case of " Gammexane " LG240 it was most marked for 6 weeks; and in DDT-chlordane, " Gammexane " P520 and 3 per cent. chlordane, for 7 weeks. There were indications that, over a 10-week period, chlordane, both as a 3 per cent. solution in kerosene and as a 2 per cent. solution in DDT-kerosene, was more effective than either DDT-kerosene solution or DDT wettable-powder suspension; the 2 BHC preparations showed no advantage over the DDT formulations. Chlordane 3 per cent. solution appeared to have exerted a limiting effect on a natural rise in *Culex* density which occurred 28–32 weeks after treatment.

The general conclusion is that any approach to the eradication of *C. fatigans* by the insecticides tested would be unsuccessful without larvicidal measures directed at the breeding places, *viz.* water-logged latrines.

R. Ford Tredre

Nicholas, W. L. **The Bionomics of** *Culicoides austeni*, **Vector of** *Acanthocheilonema perstans* **in the Rain-Forest of the British Cameroons, together with Notes on** *C. grahamii* **and other Species which may be Vectors in the Same Area.** *Ann. Trop. Med. & Parasit.* 1953, June, v. 47, No. 2, 187–206, 9 graphs & 1 fig. [18 refs.]

The author gives a detailed account of the bionomics of *Culicoides austeni* and to a limited extent of *C. grahami*, *C. inornatipennis* and *C. fulvithorax* in the rain forests of the British Cameroons. The investigations are intended to provide a basis for the control of the vectors of *Dipetalonema perstans* in West Africa. Certain aspects of the bionomics of these flies, such as daily biting cycles and host preference, were studied in some detail. Observations were also made on mating and resting habits, development of eggs, larval and pupal habitats and the duration of the life-cycle.

During fine weather, *C. austeni* females were observed to fly and bite throughout the hours of darkness but not during the day. *C. grahami* started biting at dawn with 2 peaks of biting density, one in the morning and another in the evening; they were also in flight during these hours. *C. fulvithorax* was observed biting only in the night, although in natural rain forest both this species and *C. austeni* continued to bite up to half an hour after dawn. In the forest canopy, *C. grahami*, *C. fulvithorax* and *C. inornatipennis* but not *C. austeni* were taken in small numbers; on the other hand, all 4 species occurred at ground level. *C. austeni* did not bite during heavy rain but started biting soon after. *C. grahami* continued to bite during rainy weather, even in the middle of the afternoon, though it did not normally do so in fine weather. High wind appeared to inhibit biting. Investigations on host preference showed that goats and pigs were attacked by *C. grahami* and *C. austeni*, but hens were not bitten. In the case of *C. austeni*, the author points out that the evidence that it will not feed on fowl is inconclusive. Collections made in a banana plantation showed both males and females of *C. austeni* to be most active for a brief period just before dark, a fact which suggests that a male swarming flight, followed by mating, takes place at this time; there is some evidence of a similar activity by *C. grahami* and *C. fulvithorax* in the early evening. The spermathecae of 11 out of 12 *C. austeni* caught while biting or immediately afterwards contained spermatozoa.

A blood meal was necessary for the development of the eggs of *C. austeni* but flies with developing eggs never took another blood meal: wild flies

oviposited after 3 days under laboratory conditions, the majority of them dying on the night of oviposition without feeding again. This is in contrast to the earlier work of Dyce Sharp [see this *Bulletin*, 1928, v. 25, 473] who kept the flies alive for 10 days, a second blood meal being given on the third or fourth day after they had oviposited. As the author points out in the present paper, if *C. austeni* is to be incriminated as a vector of *D. perstans*, it should be shown that the flies can survive oviposition and live long enough to take a second blood meal. This he was able to do by keeping then in a 14-inch-wide organdie cage instead of the 3- × 1-inch specimen tubes used previously. Two flies caught in the field and containing " sausage forms " of filariae and undeveloped eggs indicated that they had oviposited before taking a second blood meal. Laboratory-bred flies never oviposited, even though development of eggs took place; it was further observed that in such flies eggs of a second generation may start developing although those of the first had not been laid. Eggs of wild *C. austeni* usually hatched on the third day. Desiccation decreased their viability but eggs hatched subsequently on being placed in water. Under laboratory conditions, the life-cycle from egg to adult was completed in 25 to 28 days. The larvae and the pupae were observed to live in the stumps of the banana plants and the plantain. Catches of adult *C. austeni* in one locality and their subsequent dissection showed that flies, after having fed, may remain inside buildings until the eggs developed. This was contrary to the observations in a second locality from which it would appear that flies left the house soon after feeding. In both these places the outside resting place of the adults was among dead banana and plantain leaves.

The text is well supported by graphs and tables. [See also this *Bulletin*, 1953, v. 50, 134, 748.] *M. G. R. Varma*

See also p. 5, Muirhead-Thomson, **Inter-Relations between Filarial and Malarial Infections in** *Anopheles gambiae*.

Rodhain, J. La pathogénie des filarioses humaines, examinée à la lumière des récents progrès thérapeutiques. [**Pathogenesis of Filariasis in Man in the Light of Modern Advances in Therapeutics**] *Acta Tropica*. Basle. 1953, v. 10, No. 3, 194–208. [31 refs.]

This paper was read at the 5th International Congress of Tropical Medicine and Malaria at Istanbul in September, 1953, but was received by *Acta Tropica* on the 10th July. It represents an excellent summary of the present knowledge of the pathological action of the various species of human filariae, but there are no actual original observations which have not hitherto been published. The outstanding feature is that contrary to what is known of other groups of helminths, the penetration of the human body by the infective larval stage is not accompanied by any appreciable general or local reaction. *Philip Manson-Bahr*

Kershaw, W. E., Lavoipierre, M. M. J. & Chalmers, T. A. **Studies on the Intake of Microfilariae by their Insect Vectors, their Survival, and their Effect on the Survival of their Vectors. I.—***Dirofilaria immitis* **and** *Aëdes aegypti*. *Ann. Trop. Med. Parasit.* 1953, June, v. 47, No. 2, 207–24, 7 figs. [28 refs.]

This paper reports on experiments concerning the relationship of the intake of microfilariae of *Dirofilaria immitis* from a dog by *Aëdes aegypti*

to the longevity of the infected mosquitoes. A control group of mosquitoes were fed on an uninfected dog.

In a review of the literature on the effect of different filarial parasites on their mosquito hosts, the authors emphasize the contradictory findings of earlier workers and the wide variation in the number of microfilariae taken up by individual mosquitoes; they further observe that, formerly, more prominence has been given to the fact that occasional mosquitoes feeding on an infected host ingest a much larger number of microfilariae than would be expected from their density in a corresponding volume of the host's blood. However, as a result of experiments described in the present paper in which *Aëdes aegypti* were fed on a dog infected with large numbers of the microfilariae of *Dirofilaria immitis*, the authors concluded that most mosquitoes took in fewer microfilariae than might have been expected, irrespective of the size of the blood meal, though a very few took in much larger numbers. They further showed that there is no evident relation between the time spent in feeding and the intake of microfilariae.

In discussing their results and comparing them with those obtained by earlier workers, the authors point out that they could not obtain any evidence for a chemotropism exerted by the salivary secretion of the mosquito—a hypothesis put forward by some to explain the large numbers of microfilariae taken up. According to them the variation in the number of microfilariae ingested by individual mosquitoes may be due to: (1) the method of feeding, mosquitoes feeding directly from a capillary taking in a larger number of microfilariae than those feeding from a pool derived from a lacerated capillary, and (2) the different concentrations of microfilariae available in neighbouring capillaries. It is pointed out that the smaller number of microfilariae in an extravasated " pool " may be due to the more tardy escape of microfilariae than of blood cells through the lacerated wall of a capillary. These views agree closely with those of Gordon and Lumsden [this *Bulletin*, 1940, v. 37, 653]. It is suggested in the present paper that mosquitoes which take in fewer microfilariae may be more efficient vectors, as those which take in greater numbers perish early.

The effect of microfilariae on the survival rate of *Aëdes aegypti* was investigated in the laboratory by observing the survival rate of 2 groups of mosquitoes, one fed on an infected dog and the second on an uninfected dog. An analysis of the results showed that the rates were made up of 3 components. The uninfected mosquitoes had a constant and high survival rate over the first 5 days, a constant but slightly lower survival rate from the fifth to the twelfth day and a constant but still lower survival rate from the twelfth to the twentieth day. The authors show that the Gompertz diagram (a curve showing the relation between the rate of mortality and the age of the population, obtained by plotting the logarithm of the rate of mortality, called the " Gompertz function," as ordinates and the time in days as abscissae) for uninfected mosquitoes is not linear but a sweeping curve while those for man and the mouse in a natural environment, as well as for wild-type males and starved wild males of *Drosophila melanogaster*, are linear. It can be shown that any displacements from the straight line are due to the lethal effect of various injuries. According to the authors, one of the explanations for the anomalous sweeping curve in the Gompertz diagram of the uninfected mosquitoes could be that the laboratory conditions under which they were kept were not optimal, the conditions themselves constituting a " biological injury ". The infected mosquitoes had a constant but a very low survival rate during the first 5 days (when the microfilariae move from the midgut to the Malpighian tubules); a constant and high survival rate from the 5th to the 20th day, corresponding

to the development in the tubules, and a very low but constant survival rate from the 21st to the 25th day, corresponding to the presence of infective forms in the haemocoele and the head and mouthparts. The Gompertz diagram for the infected group of mosquitoes is roughly U-shaped with high mortality rates at the beginning and end of the experiment. During the intermediate period, mortality rates appear to be of the same order in both infected and uninfected mosquitoes. As both groups were kept under the same conditions, the wide displacement of the Gompertz diagram for the infected mosquitoes from that for the uninfected ones shows additional "biological injuries" due to infection by the microfilariae.

M. G. R. Varma

Dalmat, H. T. & Gibson, C. L. **A Study of Flight Range and Longevity of Blackflies (Diptera, Simuliidae) infected with** *Onchocerca volvulus*. Reprinted from *Ann. Entom. Soc. of America*. 1952, Dec., v. 45, No. 4, 605–12, 1 map.

This paper reports on an extension of earlier work on the flight range of *Simulium* species in Guatemala [this *Bulletin*, 1952, v. 49, 291; 1953, v. 50, 658]. With 6 aniline dyes marking was done over a period of 12 days but in the present work only flies which had just engorged on persons infected with *Onchocerca volvulus*, and proven infective to flies, were marked. Collections for the recapture of marked flies were not begun until after the ninth day of the marking period. Thereafter, 669 visits were made to 21 catching stations on 60 non-consecutive days. The number of marked, infected flies released was 40,474 (30,748 *S. ochraceum*, 8,625 *S. metallicum*, and 1,101 *S. callidum*). Among 55,366 *S. ochraceum*, 81,475 *S. metallicum* and 7,867 *S. callidum* recaptured later there were 42 marked flies. Three were infected with stages of *O. volvulus* which were consistent with infection with microfilariae on the day they were marked. (Examination of flies for onchocercal infection was made by serial section in the sagittal plane.) These infected flies (2 *S. ochraceum* and 1 *S. callidum*) had flown 2·7 to 2·9 miles in about 2 to 4 days.

These results are discussed in the light of experimental work on the infection rates in flies and death rates of infected flies under laboratory conditions. Only about half of the flies become infected and there is a high mortality within the first 4 days after ingesting the microfilariae. It is suggested that the poor returns of marked infected flies in the field experiment, and failure to find them after the first 4 days, indicate that a high mortality of the marked infected flies occurred within a few days of becoming initially infected and marked. Control measures for onchocerciasis may have to be extended for nearly 3 miles beyond the area to be protected.

D. S. Bertram

Ruiz Reyes, F. Terapéutica de la oncocercosis, uso actual de drogas especificas, suraminas y dietilcarbamazina. [**Treatment of Onchocerciasis by Suramin and Diethylcarbamazine**] *Medicina*. Mexico. 1953, Aug. 25, v. 33, No. 682, 377–84. [17 refs.]

Suramin, known also by the trade names Bayer 205, Germanin, Moranyl and others, has a certain toxic effect evidenced by albuminuria and diarrhoea; it is given in weekly injections in doses of 1 gm. for 6 to 10 weeks. The female *Onchocerca* is usually killed after 4 or 5 injections; the male resists longer and the embryos may persist till the course of 10 gm. is completed. The nodules undergo disintegration. Rarely do the embryos

persist for more than 2 months, though a negative biopsy may not be obtained for a further 2 or 3 months. Diethylcarbamazine is a colourless, crystalline product readily soluble in water. It may be given intravenously, but the usual method is 200–300 mgm. daily *per os* for 2–3 weeks. It gives rise to more marked allergic reactions than does suramin, but the cutaneous lesions tend to disappear and the ocular (keratitis, conjunctivitis) improve, microfilariae in the skin become fewer and may not be found at all and thus the infectivity of the patient is reduced. The author recommends 3 or 4 courses during the first year and 2 in the following 2 or 3 years; as a prophylactic, 4 mgm. per kgm. body weight weekly or twice a week. It has the advantage over suramin of being non-toxic and, therefore, not needing medical supervision. The above statements are based, says the author, on " more than 60,000 treatments of onchocerca patients ".

H. Harold Scott

Ricci, M. Ricerche parassitologiche nell'Isola d'Ischia. V.—Ancora sulla diffusione della ossiurosi nella popolazione infantile. [**Parasitological Studies on the Island of Ischia. V. On the Spread of Enterobiasis among the Children**] *Riv. di Parassit.* Rome. 1953, July, v. 14, No. 3, 171–9. English summary.

This is the third investigation of the prevalence of *Enterobius* infection which the author has undertaken in this area; the first in September–October, 1951, the second in May–June, 1952, and the present in the latter half of October, 1952. Three localities were selected: Barano, Forio and Porto d'Ischia. In the first investigation a total of 331 children (according to a table) between the ages of 6 and 12 years were examined by the Cellophane tape method and 32·63 per cent. were found infected, 26·74 per cent. of 187 males and 40·28 in 144 females. Of 84 in Barano 38·1 per cent. were positive; of 137 in Forio 33·58 and of 110 in Porto 27·27 per cent.

In the second investigation 667 (418 boys and 249 girls) were examined and 48·43 per cent. were positive, males and females almost equally, 47·61 and 49·80 per cent., respectively. In Barano 52·45 per cent. of 265; in Forio 49·75 per cent. of 173, and in Porto 42·79 per cent. of 229.

In this, third, investigation 610 altogether were examined and 38·69 per cent. were found positive; 37·8 per cent. of 418 boys and 40·63 per cent. of 192 girls. In Barano 39·81 per cent. of 202; in Forio 38·24 per cent. of 238, and 37·06 per cent. of 170 in Porto. There seemed to be a maximum infection rate at the beginning of summer and a minimum at the end, but this is ascribed to influx of the children from the schools and to the greater frequentation of the bathing beaches. The sex differences are not statistically significant. Moreover, the infection rates are very little different at the different ages. The author ascribes the prevalence as due in part to the not too satisfactory state of personal and general public hygiene, and in part to the " temporary agglomeration of the children released from school restrictions " [abstracter's translation]. [See this *Bulletin*, 1952, v. 49, 710; 1953, v. 50, 327, 511.] *H. Harold Scott*

White, R. H. R. & Standen, O. D. **Piperazine in the Treatment of Threadworms in Children. Report on a Clinical Trial.** *Brit. Med. J.* 1953, Oct. 3, 755–7, 1 chart. [15 refs.]

The authors tested the effects of diphenan, gentian violet and piperazine hydrate on human infections with *Enterobius vermicularis*. The successful use of piperazine for the treatment of these infections has been recorded by

Mouriquand *et al.* (*J. méd. Lyon.*, 1951, v. 32, 189) and by Turpin *et al.* (*Thérapie*, 1952, v. 7, 108). The authors also refer to other literature on this subject.

The patients were children admitted to hospital for medical or surgical reasons and their infections were verified by means of Cellophane swabs. The children were divided into 4 groups, each of which received either piperazine, gentian violet, diphenan or a lactose placebo. In 19 per cent. of the cases a cure was obtained with the lactose placebo, the criterion of cure being 7 successive daily negative Cellophane swabs.

Piperazine hydrate was given in the form of a flavoured syrup, some children receiving 100 mgm. per day per year of life and others 250 mgm. per day per year of life, the drug being given in divided doses, morning and evening for 7 days, a second similar course being given after 7 days' rest. Gentian violet was given as sugar-coated pills at a dose-level of about 11 mgm. daily per year of life in divided dosage for 7 days, with a repetition after 7 days. Diphenan was given as whole (or fractions of) plain 500 mgm. tablets, the dose-range being 100 to 300 mgm. three times a day per year of life in the lower dose group and about 200 to 600 mgm. three times a day for the higher dose group, these doses being given for 7 days with repetition after 7 days. The lactose placebo was given morning and evening in 2 courses with 7 days interval. Swabbing began 14 days after the end of the second course of treatment. No special hygienic precautions were imposed upon the children. Only one patient showed intolerance of piperazine, namely diarrhoea, which ceased when treatment was discontinued. The authors quote literature reporting the lack of toxicity of this drug. Of 20 cases treated with gentian violet, 2 had abdominal pain and one had nausea and vomiting. There were no toxic effects of diphenan.

At 100 mgm. per day per year of life, piperazine hydrate gave a lower cure rate than gentian violet at 11 mgm. per day per year of life, the cure rates being 54 per cent. and 70 per cent. respectively. At the higher dose rate of 250 mgm. per day per year of life piperazine hydrate gave 83 per cent. of cures among 42 cases treated. The efficiency of diphenan, at both dose rates used, closely resembled that of the lactose placebo, that of diphenan being 17 per cent. among 23 cases and that of the placebo 19 per cent. among 16 cases. The weight/dose/cure rate of piperazine hydrate was 97 per cent. when the daily dose was above 50 mgm./kgm. body weight. The cures obtained with the placebo indicated that spontaneous clearance of the worms may occur in about 19 per cent. of cases.

The authors conclude that piperazine hydrate was the most effective of the drugs tested and that it produced negligible side effects; that gentian violet was less effective and produced undesirable nausea and staining; and that diphenan was not effective. They consider that piperazine hydrate syrup at a dose level of 50 to 75 mgm./kgm. per day is the drug of choice. The use of suppositories is not necessary. *G. Lapage*

Standen, O. D. **Experimental Chemotherapy of Oxyuriasis.** *Brit. Med. J.* 1953, Oct. 3, 757–8.

The author tested in the laboratory the efficacy of 16 substances said to be effective for the treatment of human infections with *Enterobius vermicularis* by giving them to white mice, 11 to 12 weeks old, which were infected with the oxyurid nematode *Aspicularis tetraptera*. This relative of *E. vermicularis* has been used by other workers. Standen used natural infections of the mice and the drugs were given by stomach tube as solutions

or suspensions in water or liquid paraffin either once or twice daily for 5 consecutive days. Faecal examinations were made at 6 days and necropsy at 12 days after the end of treatment, or at 6 days after treatment without previous faecal examination. Storage of the rectum and caecum of the mice in Bouin's fixative helped worm-counts, because this fixative stained the worms bright yellow.

A table shows the relative efficiency of the drugs tested. None of the drugs was particularly toxic, except perhaps oil of garlic. The efficiency of egressin, hetrazan, nyxolan syrup, diphenan, garlic, allyl sulphide and liquid paraffin was rated as nil. The clearance effect by santonin (20 per cent.) mepacrine (25 per cent.) and hexylresorcinol (40 per cent.) were "not convincing"; but the clearances effected by gentian violet and piperazine were investigated further. A second table gives the results then obtained. It was concluded that, in terms of dose/weight ratio, gentian violet was rather more efficient than piperazine hydrate in clearing mice of *A. tetraptera*, but that the latter drug was promising and worthy of clinical trials on human infections with *Enterobius vermicularis*. The results of trials on human infections showed that diphenan is inactive against *E. vermicularis* and that both gentian violet and piperazine hydrate are active against it [see p. 86, above, White and Standen]. *G. Lapage*

Evans, A. D. & Lennox, Mary. **An Outbreak of Trichiniasis in Barry, Glamorgan. Improved Technique for Demonstration of *Trichinella* in Muscle.** *Brit. Med. J.* 1953, July 18, 131–3.

The authors report on a small outbreak of trichiniasis in the Borough of Barry, Glamorgan, in May, 1952. The population of this Borough was 41,000 and 25 people were infected as a result of eating infected sausage meat manufactured from a pig imported from one of two farms in Pembrokeshire. Pigs from this county have caused earlier outbreaks. Young [this *Bulletin*, 1948, v. 45, 355] has reviewed the literature of trichiniasis in Britain. In 17 of the 25 patients the incubation period ranged from 11 to 27 days; in 14 of them the first symptoms appeared on the 15th and 24th days. Sixteen patients were between 30 and 40 years old and 5 between 40 and 50. There was no tendency towards involvement of any social class. No deaths occurred, but 2 patients were critically ill. Low mortality is a feature of the disease in Britain, perhaps because pork is not eaten raw and the infecting dose is therefore smaller. Only 4 patients showed the typical history of gastroenteritis followed by oedema and muscle-pains. The commonest presenting symptom was periorbital oedema. The authors think that this, combined with eosinophilia developing within 14 days, is pathognomonic of trichiniasis. Muscle pains were almost always present, but gastroenteritis occurred in only 16 per cent. of the cases.

Investigation showed that rats on the farms were the source of the infection, rather than the food of the pigs. The larvae of *T. spiralis* were found in one of the 4 rats available for study. The larvae were also found in 4 out of 288 diaphragms of pigs from West Pembrokeshire, but none was found in 262 diaphragms of pigs from the Vale of Glamorgan, which usually supplies Barry. The authors believe that this is the first time that *Trichinella* larvae have been found in either rats or pigs in West Pembrokeshire.

The technique used for the examination of the rats and diaphragms of pigs is described, which uses, after digestion of the rats or pig-diaphragms with pepsin, further digestion with pancreatin, which removes muscle fibres

still present after peptic digestion. Experiment showed that this method revealed nearly twice as many larvae as peptic digestion by itself did.

G. Lapage

Stoner, R. D. & Godwin, J. T. **The Effects of ACTH and Cortisone upon Susceptibility to Trichinosis in Mice.** *Amer. J. Path.* 1953, Sept.–Oct., v. 29, No. 5, 943–50, 2 figs.

"From these observations, it is evident that ACTH and cortisone do not favorably alter the course of experimental trichinosis in mice. A slight increase in susceptibility to trichinella infections was noted following treatment with ACTH.

"A characteristic eosinophilia appeared during the third week of infection in both the infected control group and the ACTH-treated group. An equal level of precipitins for trichinella precipitinogen was found for ACTH-treated mice and infected controls on the 25th day of the infection. Pathologic study revealed no significant changes either in degree or type of inflammatory infiltration in treated and untreated animals or in the number of encysted parasites. Antibiotic control of concomitant bacterial infection combined with ACTH did not decrease the final mortality observed with the experimental trichinella infections.

"Cortisone therapy in trichinella-infected mice produced a significant increase in susceptibility as shown by a 45 per cent increase in mortality. Eosinophilia did not appear in cortisone-treated infected animals. Antibiotic control of secondary bacterial infections with combiotic, combined with various doses of cortisone, did not decrease the final mortality in trichinella-infected mice." [See also this *Bulletin*, 1952, v. 49, 432.]

DEFICIENCY DISEASES

Govil, K. K. **Clinical Assessment of Nutritional Status of School Boys in Uttar Pradesh.** *Indian Med. Gaz.* 1952, Dec, v. 87, No. 12, 567–73, 2 charts. [17 refs.]

The state of nutrition of 6,371 boys aged 5 to 16 years has been studied. The boys were heavier and taller than those in West Bengal and South India but lighter than American boys. Nutritional status was represented as good 3·7 per cent., fair 55·7 per cent., poor 37·2 per cent. and very poor 3·7 per cent. Conjunctival xerosis (11·2 per cent.) and pigmentation (18·7 per cent.) were the commonest deficiency conditions found. *R. Passmore*

Squires, B. T. **Tongue Patterns of African Children in Health and in Malnutrition.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 329–33, 3 figs. on pl.

A tongue print may be made by pressing glazed paper on to a tongue previously painted with ink. A suitable ink can be made by heating in a boiling water bath for 10 minutes 2 gm. of Evans Blue (T 1824) and 10 gm. of gum acacia in 40 ml. distilled water. The print forms a permanent record and shows the predominance of filiform or fungiform papillae, the

linear arrangement of filiform papillae, and fissuring of the mucosa. Such prints may have a place as a permanent record of nutritional status. They may also be used as a rough screen for the detection of malnutrition in African children where clinical examination is not feasible. *R. Passmore*

Davies, J. N. P. **Nutrition and Nutritional Diseases.** Reprinted from *Annual Rev. Med.* 1952, v. 3, 99–132. [166 refs.]

This review deals with the problems of nutrition in Africa and, in particular, with kwashiorkor. It contains a full and competent account of the clinical and pathological features of the disease and of the dietary and social factors which contribute to its aetiology. Among the many descriptions now available there is perhaps none better suited to the needs of the general physician and pathologist.

Of special interest is the account of hormonal imbalance in Africans, a subject which the author has been one of the first to bring to the fore [this *Bulletin*, 1950, v. 47, 85]. It is now established that after long-standing damage to the liver from dietary deficiencies, notably of protein, there is not only structural damage to the liver, but also an impairment in the organ's ability to carry out its usual chemical functions. In particular, the capacity of the liver to inactivate oestrogens may be lost. It is well known that males always produce small amounts of these hormones. A failure of the liver to inactivate them may produce hormonal imbalances. This may be the background for the widespread evidence of feminization in the African male, *e.g.*, the extraordinary frequency of gynaecomastia. It may also exert an important influence on the mentality of Africans. Thus the psychological trauma resulting from an unbalanced diet may be as important as the more obvious physical disabilities. *R. Passmore*

Janssen, E. **Some Aspects of Kwashiorkor.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, June, v. 5, No. 2, 128–36. [20 refs.]

This report by a former Professor of Paediatrics in Pretoria (South Africa) is based on observations of 104 cases, uncomplicated by infectious diseases or any tropical parasitic disease. Students in European medical schools, who are intending to go to the tropics, will find here a good straightforward orthodox account of the disease.

Special stress is laid on the importance of arrest in growth "as the nuclear symptom", which is never absent and constitutes the beginning of all other disorders associated with kwashiorkor. In the prevention of the disease in Africa the necessity of close cooperation between governmental and missionary enterprise is emphasized. At present only the missionaries have the necessary knowledge of languages and tribal customs to educate primitive man into a social being. Prevention requires more than purely medical advice. *R. Passmore*

Altmann, A. Kwashiorker. **Malignant Malnutrition—Infantile Pellagra.** *South African J. Clin Sci.* Cape Town. (Incorporating *Clin. Proc.*) 1953, June, v. 4, No. 2, 71–89. [97 refs.]

A detailed account of clinical and laboratory findings in 242 non-European children with kwashiorker and 43 with simple nutritional oedema seen by

the late Dr. Altmann in Johannesburg between 1946 and 1950. Much of the literature is reviewed and details are given of electrophoretic serum-protein studies already published [this *Bulletin*, 1951, v. 48, 395].

Congo Belge. Rapport du Fonds Reine Elisabeth sur l'action commune entreprise au Congo Belge par le Gouvernement et le Fonds International de Secours à l'Enfance. Campagne de distribution de lait écrémé. [**Report of the Queen Elizabeth Fund on the Communal Enterprise in the Belgian Congo by the Government and the International Children's Fund.** Campaign for distribution of skimmed milk] [Dricot, C. & André, J.]. 93 pp. 2 maps, 3 plans & 1 chart. [23 figs. on 8 pls. (issued separately).] 1953.

Between August 1952 and May 1953, 55 tons of dried milk were distributed in the district of Kwango in the Belgian Congo with a population of 671,000 mostly living in small villages. This report describes the administrative details of the distribution and records the opinions of doctors and others of the benefits derived by the mothers and children who received the milk. It is essentially a field report of work already accomplished and few generalizations are attempted. Nevertheless, others attempting similar projects in tropical Africa may find useful practical points.

R. Passmore

Dean, R. F. A. **Plant Proteins in Child Feeding.** *Med. Res. Council Spec. Rep. Ser. No. 279.* pp. viii + 163, 1 pl. & 9 figs. [Bibliography.] 1953. London: H.M. Stationery Office. [10s.]

The unique value of milk as a food for the growing child has been established beyond any manner of doubt. This has rightly become one of the canons of nutritional science. Unfortunately in many parts of the world the supply of milk is far below the requirements of the children. However effectively animal husbandry and dairying science are developed and local surpluses of milk are preserved, stored and distributed, inevitably, and for decades to come, the gap between supply and need will continue and many children will not get a sufficiency of milk for their full potential physical development. The examination of possible substitutes for milk is therefore an important investigation for the public health in many parts of the world. That constituent of milk which is most difficult to replace is the protein, which can be assimilated and built into the tissues of the growing child more effectively than protein from any other single source.

The first part of this report discusses the difficulties of measuring the biological value of proteins and describes some of the attempts in the past to find suitable milk substitutes. The importance of finding a suitable mixture of plant proteins is stressed, for a mixture may have a biological value far above that of any of the individual components. This probably depends upon finding a combination which will provide a sufficiency of all the essential amino acids necessary for growth.

Part II describes experiments with such mixtures carried out in Germany in 1947–9. Combinations of barley, wheat and soya with and without small amounts of incorporated milk and of barley, maize and soya were tested for periods of 8 to 24 weeks. About 25 new-born children, 25 aged 6–12 months, 50 aged 1–2 years, 50 aged 2–6 years, and 625 aged 7–11 years took part in trials. For children up to 1 year about half the milk in the diet could be replaced by plant mixtures. For children 1–2 years old, at least 2 of the mixtures seemed to be nearly perfect milk substitutes.

For older children nearly all the mixtures gave good results, but optimum growth was seldom obtained without a little milk. The report emphasizes the importance of small variations in manufacture and the difficulties in assessing results. Clearly methods and results cannot be transferred wholesale to other countries, where there are different cereals available and the basic diets of the children are not the same. But the general principles are undoubtedly sound.

This report is a work of scholarship. There is a bibliography of over 400 references; this is not merely a catalogue, for most of the papers are critically appraised. The report is also a practical manual and details of technique both for preparing mixtures and arranging trials are set out with great thoroughness. It should be read by persons responsible for the health of children in many parts of the world, especially in the tropics.

R. Passmore

SPRUE

DE LANGEN, C. D. **Steatorrhoea and the Intestinal Circulation.** *Acta Med. Scandinavica.* 1953, June 30, v. 146, No. 1, 7–19. [21 refs.]

[This and the three abstracts which follow summarize a symposium on the sprue syndrome at the Second International Congress of Internal Medicine, held in London in September, 1952.]

The author points out that in theories interpreting the absorptive function of the intestinal wall too little consideration has been given to the dynamics and physiology of the local circulation. He advances arguments which suggest that meteorism in sprue results not so much from abnormal formation of gas as from inadequate gas absorption arising mainly from disturbances in the circulation of blood in the gut. He then considers the question of whether in sprue the disturbed gut circulation is the result of the steatorrhoea or *vice versa*. In a very interesting and provocative discussion he gives his own views of the function of the villi and the part played therein by the intestinal capillary bed. When studied with a "capillary microscope" the movements of the villi "give the impression of a suction and pumping movement. The villi are expanded under the influence of the blood which fills the capillaries; this happens slowly, while the contraction phase is much more rapid. The capillaries are surrounded by extracellular fluid, which fills the space between the capillaries and the epithelium layer. The efferent lymph vessels are situated in this extracellular fluid. Diffusion and absorption take place between the contents of the intestine at the outside of the villi and the extracellular fluid around the capillaries. Each villus has a relatively extensive capillary bed; the venous portion is certainly at least several times as big as the arterial loop; therefore it contains more blood. As is the case in all nutritional capillaries a portion of the blood (especially water) leaves the arterial side of the loop, as a result of which the colloid osmotic pressure of the blood in the venous portion increases considerably; then it diminishes in the tissue fluid. With influx of blood in the capillaries the afferent arteriole is open, while the efferent venule is partially or totally closed. Proportional to the width of the afferent vessel and that of the two efferent vessels (the venules) a capillary pressure of much varying magnitude may be obtained: this also determines the pressure under which fluid leaves the capillary part of the loop. An exchange is simultaneously set up between intestinal contents and pericapillary fluid. The momentum of the inflowing capillary blood

causes also a flow of tissue fluid in the direction of the villus basis, whereby lymph is caused to flow also in the same direction.

"When a satisfactory filling and pressure of the capillary bed in the villi is established, the afferent loop contracts or closes. At this stage the efferent vessels open and the capillaries contract actively, thereby causing the fluid to flow into the capillaries, by means of the high colloid osmotic pressure in the venous side of the capillaries, and the low hydrostatic pressure which is caused by the opening lumina of the venules. In this way, the contents of the villi are then transported along different channels: the venules, the lymphatics and the extracellular fluid. In addition the pressure in the gut becomes simultaneously greater than in the villi, with the result that these do not contract—as is usually supposed—but shrink."

The author continues by discussing the mechanics of the absorption of fat particles in relation to the shape of their molecules and finds himself in general agreement with Frazer [below], except in so far as the significance of mucus is concerned. After admitting that his communication was deliberately weighted in favour of his thesis in the hope [surely to be justified] of stimulating criticism, the author ends by suggesting that when more significance is attributed to the intestinal circulation, clinical and biochemical problems will be better understood. *B. G. Maegraith*

Froehlich, A. L. **Blood Changes and Avitaminosis in Idiopathic Steatorrhea.** *Acta Med. Scandinavica.* 1953, June 30, v. 146, No. 1, 20–21.

Blood changes: A summary of some of the changes in chemical constitution of blood is given. Most of the information is already well known. The author states that feeding with glycocoll is followed by an increase in blood aminoacids below the normal range. The increase in vitamin A blood level after administration is also far below normal; this can be corrected by simultaneous administration of lecithin or an emulsifying agent.

Bile: In 3 cases neither bile nor choline could be detected in duodenal bile.

Avitaminosis: Deficiencies of the B group are more typical of tropical sprue than of idiopathic steatorrhoea. Deficiency of fat soluble vitamins with the exception of A is common. Hypoprothrombinaemia is frequent but haemorrhagic syndromes do not occur often. Avitaminosis D is most frequent. A decrease of serum calcium with low urinary calcium (responding to administration of vitamin D) occurs in most cases.

[The author, referring to the flat blood glucose curve obtained after ingestion of glucose, notes the general agreement that it could be ascribed to faulty or delayed absorption and adds "an alternative hypothesis would be that ingested glucose is fixed by the liver and does not appear in the systemic circulation". The reviewer wonders how the author interprets the well-known observations of Fairley on the blood sugar curves following intravenous injection of glucose in sprue.] *B. G. Maegraith*

Frazer, A. C. **Aetiology of Idiopathic Steatorrhoea and Related Conditions.** *Acta Med. Scandinavica.* 1953, June 30, v. 146, No. 1, 22–4. [18 refs.]

This communication is a summary of the author's views which have been expressed on previous occasions [this *Bulletin*, 1953, v. 50, 329].

He reiterates his conclusion that sprue may be induced by certain dietary factors causing increased secretion of mucus, decreased motility and altered bacterial content in the upper intestine. *B. G. Maegraith*

Jones, C. M. **Current Concepts of the Condition with special reference to the Therapeutic Effect of the Corticosteroids.** *Acta Med. Scandinavica.* 1953, June 30, v. 146, No. 1, 25–7.

The author discusses the progress of 9 cases of "non-tropical sprue", 8 of which had been followed for years and had shown only partial response to therapy with intravenous liver extract, folic acid or vitamin B_{12}. Symptoms were of only 2 years' duration in the ninth case. All the patients were ill-nourished, with skin and tongue changes, low blood protein and calcium, low platelet counts, marked anaemia "not of a macrocytic type" and flat glucose and vitamin A tolerance curves. All had steatorrhoea, and exhibited the radiographic "deficiency" pattern.

Corticosteroids were given to these patients to watch the effect on the absorptive difficulties present, not as a replacement measure. Routine blood examinations, glucose and vitamin A tolerance tests, estimation of serum fat, nitrogen and lipids and chylomicron counts were made from time to time.

In all cases there was clinical improvement during administration of corticosteroids. In 3 or 4 days abdominal distension was reduced or disappeared. A few days later stools became less frequent and more solid, and "when adequate dosages of ACTH or cortisone were administered" faecal fat was appreciably reduced. Glucose tolerance curves became nearer normal but vitamin A tolerance curves were unaffected. "There was a distinct tendency to an increase in chylomicra after a fatty meal." In most instances, discontinuance of steroid therapy resulted in a return of sprue symptoms. In 2 cases it was necessary to continue therapy for a year and a half.

The author considers that the good effects observed with corticosteroid therapy came from "stimulation of the absorptive process characteristically reduced in the sprue syndrome". The term idiopathic steatorrhoea is a misnomer, since it unduly emphasizes absorptive difficulties in fats and fat-soluble substances in a condition in which there is faulty absorption of other elements.

[Intentionally or otherwise, there is no clear distinction drawn in the paper between sprue and idiopathic steatorrhoea. No reference is made to fat absorption tests before, during or after therapy. It is difficult to see how the claim that absorptive processes (presumably including fat absorption) are stimulated by the therapy can be substantiated under these circumstances.] *B. G. Maegraith*

Acta Med. Scandinavica. 1953, June 30, v. 146, No. 1, 28–32. [**Discussion of 4 Papers on the Sprue Syndrome at the 2nd International Congress of Internal Medicine, London, 1952.**]

Points which arose in this discussion included the following:—

Dr. Bulic reported that in 1944 an outbreak of steatorrhoea occurred in the Yugoslav army stationed in the hills at about 3,000 feet. The syndrome included cachexia, dehydration, stomatitis, glossitis, rapid emaciation and apathy, with the frequent passage of copious frothy fatty stools. In one area tinned food and refined flour made available by the allies did not affect the steatorrhoea. Later, in the plains, fruit, milk and fresh food became available and immediate clinical improvement was noted.

Hypotension was noted by Dr. Salvesen in 84 cases of idiopathic and symptomatic steatorrhoea [this *Bulletin*, 1953, v. 50, 843].

Cases of sprue seen in Portugal can be grouped into 2 categories, one of which sometimes fails to respond readily to hepatic extracts, folic acid and vitamin B12, sometimes coupled with blood transfusion. Dr. Vaz Serra suggests that these cases might be secondary to untreated bacillary dysentery. [This view is not widely shared by other workers.] He considers that sulphonamide and other similar treatment should not be overlooked.

In sprue patients after the tissues have been "loaded" with folic acid by injection, Dr. Girdwood finds that the output of folic acid in the urine is much less after 5 mgm. of folic acid given orally than it is after the same dose parenterally. This indicates poor intestinal absorption. "A sprue patient with megaloblastic anaemia ceased to respond haematologically or otherwise to folic acid injections, but responded thereafter to vitamin B_{12} injections (Penicillin was also given)."

Dr. Adlersberg and his colleagues reported the treatment of 10 sprue patients with cortisone and ACTH. Nine of these patients had proved resistant to accepted sprue therapy. The results of treatment varied from patient to patient. Clinical improvement was shown by disappearance of diarrhoea, improved sense of well-being and appetite, and gain in weight. Patients were maintained without ill effect on very small doses for months. Symptoms returned quickly after cessation of therapy, the patients ultimately presenting "a clinical condition similar to that before initiation of hormonal therapy."

Dr. Adlersberg and Glaser reported 4 instances in 6 years of colonic volvulus in non-tropical sprue. They suggest that volvulus may represent a not infrequent complication of non-tropical sprue.

Dr. Holten described a case of steatorrhoea (50 per cent. dry faecal weight was fat, of which 25 per cent. was soap), which was considered to arise from obliteration of small intestinal lymphatics by an inflammatory tumour diagnosed by biopsy and successfully treated.

Dr. Martin pointed out that none of the metabolic changes described in steatorrhoea appeared to be obligatory or constant. There were, for instance, long-standing cases of steatorrhoea without anaemia, hypoproteinaemia, etc. Some patients had bony changes, others had not. Attention should be paid to these variations. It was not always so easy to distinguish between steatorrhoea resulting from pancreatic disturbances and that arising from absorptive defects. For instance, steatorrhoea due to pancreatic insufficiency should result in the passage of neutral fat, but it often results in the passage of fatty acids, the digestion of neutral fat having taken place in the intestine in spite of the insufficiency of lipase. The author referred to his own published case in which total disappearance of pancreatic parenchyma was accompanied by stool fat mostly in the form of fatty acids, and to the statement of de Langen that "smoking a fat cigar could provoke a fatty stool" [abstracter's translation]. Moreover, what was the significance of the changes in bile during sprue reported by Brull and Froehlich? The author felt that more attention should be given to modification in enzyme activity and intestinal flora in the gut, especially in secondary forms of steatorrhoea. *B. G. Maegraith*

Manson-Bahr, P. **The Causation of Tropical Sprue. A Hypothesis.** *Lancet.* 1953, Aug. 22, 389–91, 1 map. [21 refs.]

"Tropical sprue is an important disease which remains a mystery.

"Recent work has to some extent cleared up the origins of coeliac disease and idiopathic steatorrhoea, which have been confused with tropical sprue because they closely resemble it. This work has shown that in

coeliac disease in children the gluten of wheat is chiefly responsible for the illness.

" It is suggested that tropical sprue has a quite different origin: though outwardly similar, it is fundamentally dissimilar. It has a distinct and peculiar geographical distribution, being entirely absent from some tropical countries (notably Central and South Africa); it has an incubation period; and may occur in several individuals closely associated (*e.g.*, in members of the same family) or even in small epidemics. This suggests infection, perhaps by a virus.

" It is suggested that such a virus exists in the tongue and mouth lesions and thence spreads to the intestinal tract, affecting especially the ileum. The subsequent phenomena of tropical sprue can be explained by changes in the intestinal flora and interference with the absorption of vitamins leading to the typical megaloblastic anaemia.

" The existence of a virus attacking the alimentary tract is the only hypothesis which will explain all the apparently contradictory characteristics of this disease and the extraordinary periods of latency which it sometimes exhibits."

GIRDWOOD, R. H. **A Folic-Acid Excretion Test in the Investigation of Intestinal Malabsorption.** *Lancet.* 1953, July 11, 53–60. [12 refs.]

The author describes the results of folic acid urinary excretion tests in examples of upper intestinal malabsorption, including among the 11 cases 4 of idiopathic steatorrhoea and 2 of tropical sprue. All showed considerable deficiency of folic acid absorption. There were 14 normal controls. Comparison was also made with 15 cases of pernicious anaemia and 5 of pregnancy anaemia. He suggests that the test might prove useful in the diagnosis of the sprue syndrome since it does not (unlike the fat absorption test) require the patient's stay in hospital on a special diet.

The estimation of urinary folic acid is based on the growth of a certain strain of streptococcus in a special medium, in which the growth is dependent on the amount of folic acid present. Estimations are made nephetometrically. The test could be carried out in some centrally placed laboratory.

The author points out that tropical sprue as described in South America and the United States " appears to differ from that described by European authors. In America, primary malnutrition is considered to be an important aetiological factor, but this is not so in cases described by most European authors. The application of a differential folic-acid excretion test may perhaps prove to be of value in differentiating between tropical sprue on the one hand and nutritional megaloblastic anaemia on the other. It is, however, possible that long-continued primary malnutrition may lead to such widespread general atrophy that the gut wall may be involved and secondary malnutrition due to malabsorption thereby superadded."

[A similar comment was made by WOODRUFF recently: see this *Bulletin*, 1953, v. 50, 329.] *B. G. Maegraith*

SALVESEN, H. A. & BÖE, J. **Osteomalacia in Sprue.** *Acta Med. Scandinavica*, 1953, Aug. 19, v. 146, No. 4, 290–99, 1 fig. [13 refs.]

The authors examined the calcium and phosphate content of the sera of 85 cases of " sprue ". In 40 patients the solubility product Ca × P was below the critical level (which they put at 27). The chemical conditions in these patients were thus, according to the authors, those necessary for the

development of osteomalacia. Twenty-two of them had signs of bone changes and some degree of hypophosphataemia. The authors suggest that these patients were suffering from " secondary hyperparathyroidism ".

[" Sprue " is not satisfactorily defined in this paper, which the abstracter finds somewhat unconvincing.] *B. G. Maegraith*

MEYER, L. M., SUAREZ, R. M., Jr., BUSO, R., SABATER, J. & SUAREZ, R. M. **Oral Administration of Co^{60} Vit. B_{12} in Tropical Sprue and Hepatic Cirrhosis and Diarrhea.** *Proc. Soc. Exper. Biol & Med.* 1953, Aug.–Sept., v. 83, No. 4, 681–3.

" From the data it is apparent that no conclusion can be reached regarding interpretation of Co^{60} activity in the stool following oral administration of 0·5 μg of radioactive vit. B_{12} because of the wide normal range which overlaps with that of patients with tropical sprue in relapse and one subject with hepatic cirrhosis and diarrhea. No consistent pattern of change was observed when folic acid was added. The variable results do not bear any relationship to the presence or absence of free HCl in gastric juice."

HAEMATOLOGY

MARTIN, M. Les syndromes anémiques en pratique tropicale. [**The Anaemias in Tropical Practice**] *Méd. Trop.* Marseilles. 1953, May–June, v. 13, No. 3, 289–303.

The article surveys anaemia in the tropics and is similar in its scope and layout to the " Refresher Courses " appearing in the *British Medical Journal*. It is pointed out that anaemia with its high incidence and the great variety of its causes represents a major medical problem in the tropics. There are 7 main groups of anaemias, namely those with (1) oedema, (2) diarrhoea and emaciation (*Strongyloides stercoralis* and amoebic and bacillary dysentery being the causes), (3) emaciation, oedema and intestinal upset (sprue, kwashiorkor), (4) hepatomegaly (cirrhosis and neoplasm of the liver), (5) splenomegaly (febrile: kala azar, malaria; non-febrile: schistosomiasis), (6) haemoglobinuria, (7) chronic haemolysis (thalassaemia, sickle-cell anaemia). A detailed scheme for the investigation of an anaemic patient concludes the article. *H. Lehmann*

LANARI, A., GARCÍA SANTOS, A. & NÚÑEZ, C. Adaptaciones hemodinámicas en las anemias tropicales. [**Haemodynamic Changes in Tropical Anaemias**] *Bol. Oficina Sanitaria Panamericana.* 1953, June, v. 34, No. 6, 563–75. [35 refs.]

The English summary appended to the paper is as follows:—

" A study is made of the hemodynamic changes in 11 patients with ' tropical anemia ' in varying degrees of severity. It is observed that the volemia is slightly decreased, the circulatory minute volume at rest augmented, sometimes up to three times its normal value. In moderate exercise the circulatory minute volume reached in some cases up to six times its normal value at rest. There is a better correlation between the decreased Hb and the ' circulatory equivalent ', *i.e.*, the arterio-venous

difference per 100 ml of O_2 consumed, than with the cardiac index. Below 5 grams the circulatory minute volume markedly increases.

"The study of the arterial Hb saturation showed definite insaturation in patients with less than 6 grams of Hb. The reason for this paradoxical result is discussed considering that the deviation of the curve of Hb to the right and the physiologic venous admission of very insaturated blood might cause this increase of arterial insaturation. Regarding ventilation at rest and in exercise, there is a slight increase under both conditions, which is noticeable even five minutes after the exercise."

KOTHARI, B. V. & BHENDE, Y. M. **Nutritional Megaloblastic Anaemia of Pregnancy: a Study of 100 Cases.** *Indian J. Med. Res.* 1952, July, v. 40, No. 3, 387–429, 10 graphs & 3 figs. on pl. [27 refs.]

Out of 120 patients with anaemia admitted to a maternity hospital in Bombay, 20 showed a normoblastic reaction in the bone-marrow and 100 a megaloblastic. The latter group constitutes the subjects of the investigation reported.

The patients were all of a low socio-economic status; 87 were Hindus and 10 Christians [presumably Indian Christians]; 66 were non-vegetarians but ate fish or meat only about once a week. The *impression* was that the diets of all the patients were deficient in total proteins and in protective articles of diet. [The enquiry did not include any dietary investigations nor is evidence presented that the socio-economic status of the subjects differed in any way from that of the other patients in this hospital, many of whom were presumably not anaemic.]

The age and parity graphs were almost identical with those of 500 consecutive normal pregnancies, except that there was a slightly higher relative incidence in the first 2 pregnancies. Nearly all the patients were admitted during the third trimester; the date of onset of the anaemia is not recorded.

The signs and symptoms, other than those of anaemia, noted most frequently were anorexia (60), glossitis (55), cough (45), vomiting (37), numbness of extremities (35), fever (30), diarrhoea (26), koilonychia (24) and enlarged spleen (18).

The blood pictures are recorded in full in an appendix. They show that the majority of patients had a severe anaemia. The haemoglobin was below 4 grammes per 100 ml. of blood in 22 and below 6 grammes in 68. In 10 the red-cell count was below 1 million per cmm. and in 44 it was below 2 million. In 39 the cells were macrocytic and in 26 microcytic; in 15 the mean corpuscular diameter was above the upper limit of the normal range and in 11 below the lower limit; and in 51 the mean corpuscular haemoglobin concentration was below the lower limit of the normal range, and in 6 it was above. The Price-Jones curves showed that in only 6 cases was the standard deviation above 1·0 μ; the coefficient of variation was above 14 per cent. only in 5. The peripheral blood picture was thus essentially a normocytic hypochromic anaemia with little anisocytosis. There was similarly little or no spherocytosis.

Megaloblasts were found in the peripheral blood in 30 cases and in the sternal marrow in 99. The megaloblasts were mainly basophilic.

Plasma bilirubin was above normal in 17 cases. Only 3 patients had a histamine-fast achlorhydria. Ankylostome eggs were found in the stools in 17 patients. In one patient only were malaria parasites found. The Wassermann (or Kahn) test was positive in 11 cases.

The authors point out that the clinical picture is in no way characteristic, that the peripheral blood picture is equivocal, that the finding of megaloblasts is the only diagnostic criterion, and that since these are not always present in the peripheral blood a sternal puncture is essential.

The most important aetiological factor is dietary insufficiency, but the authors suggest that there are other factors, associated with pregnancy itself.

L. E. Napier

El Zahawi, S. & Shaby, Josephine. **A Fatal Case of Elliptocytosis in a White Man.** *J. Faculty of Med., Baghdad, Iraq.* 1953, v. 17, No. 3, 31–6, 4 figs. on 2 pls.

Neel, J. V. **Data pertaining to the Population Dynamics of Sickle Cell Disease.** *Amer. J. Human Genetics.* 1953, June, v. 5, No. 2, 154–67, 3 figs. [33 refs.]

Genetic studies on Negroes living in the United States have led the author to the conclusion that the sickle-cell gene is present heterozygously in the sickle-cell trait carriers and homozygously in the patients suffering from sickle-cell anaemia. The question arises how an overall sickling frequency of 20 per cent. can be maintained in the middle of Africa if all homozygotes suffer from the anaemia and presumably die prematurely. There have been divided opinions on the incidence of sickle-cell anaemia in Africa, and several workers have denied that the strict homozygous sickle-cell anaemia rule was applicable to Africa. Raper [this *Bulletin*, 1950, v. 47, 655] has suggested that in the United States where the Negro has much mixed with other races additional genes have been acquired which might be responsible for the high proportion of sickle-cell anaemia cases.

To test this hypothesis the author proceeded to analyse the relationship among Negroes residing in the United States between the apparent amount of White admixture and the occurrence and severity of sickle-cell anaemia. An " ethnic factor " was calculated for 45 patients with sickle-cell anaemia and for 104 controls of comparable background, age and sex, selected at random without reference to the sickling phenomenon. The " ethnic factor " (F. P. Thieme, *Amer. J. Human Genetics*, 1952, v. 4, 94) with a range of 4 to 64 was calculated by rating in each individual skin pigmentation (1 to 32), amount of hair curl (1 to 16), lip thickness (1 to 8) and nose shape (1 to 8), a score of 64 being characteristic for the extreme negroid type. There was no evidence for a higher degree of non-negroid admixture in the sickle-cell anaemia cases than in the control group.

If the inheritance pattern of sickle-cell trait and sickle-cell anaemia are the same in Africa and in America 2 possible explanations for the high frequency of a deleterious gene in Africa can be put forward (1) a high mutation rate, and (2) " balanced polymorphism " which could include reproductive over-compensation. There was no evidence for a high mutation rate in 71 families studied in the United States by the author. There were 4 instances of what might have been mutation but in 3 of these non-paternity was an alternative explanation. In Africa the mutation rate, *i.e.*, the ratio of genes arising in each generation through mutation to those already present would have to be 1 : 12. The alternative theory of over-compensation by higher fertility or greater survival of sickle-cell trait carriers compared with the rest of the population can only be tested in Africa. " The ' balanced polymorphism ' hypothesis, the ' high mutation rate ' hypothesis, and the explanation which draws on both hypotheses—are all so

obviously susceptible to the direct experimental attack as to discourage further speculation. The observations necessary to a decision can be made nowhere but in Africa." *H. Lehmann*

Pales, L. & Linhard, J. La sicklémie (Sickle-Cell Trait) en Afrique Occidentale Française vue de Dakar. [**Sickle-Cell Trait in French West Africa. Studies in Dakar.**] *L'Anthropologie.* 1952, v. 56, Nos. 1/2, 53–86, 4 figs. [Numerous refs.] Reprinted in *Mission Anthropologique de l'A.O.F.: Biologie Comparative des Populations de l'A.O.F.* pp. 1–34. (Dakar: Direction Génér. Santé Publique.) 1951.

A survey was carried out of sickle-cell trait incidence in French West Africa. Nine hundred and fifty-two adults and 1,350 children and adolescents (below the age of 15) were examined; 70 per cent. of the 2,302 subjects were male, and 30 per cent. were female. The trait incidence was the same at different ages and in both sexes. Blood groups were also determined and there was no correlation between groups O, A and B and the sickle-cell trait. Altogether 8 per cent. of the people were sickle-cell trait carriers. The authors divide their material into 3 racial groups: the Guinese who are related to the Negroes of British West Africa, the Sudanese who are desert dwellers and the Ethiopians having Hamitic blood. The Guinese had the highest number of sickle-cell trait carriers, 16 per cent.; in the Sudanese and the Ethiopians the incidences were 7 per cent. and 11 per cent. respectively. *H. Lehmann*

Linhard, J. Note complémentaire sur la sicklémie dans la région de Dakar. [**Supplementary Note on the Sickle-Cell Trait in the Dakar Area**] *Bull. Méd. de l'Afrique-Occidentale Française.* 1952, v. 9, No. 2, 301–8.

A survey of 3,992 French West Africans, most of them of the "Sudanese" type, showed results either identical with or similar to, though slightly lower than, those obtained on a previous occasion [see above]. There was again no sex difference in sicklaemia. It seemed that most sickle-cell trait carriers were rhesus positive and possessed the blood group P. *H. Lehmann*

Horsfall, W. R. & Lehmann, H. **Absence of the Sickle Cell Trait in Seventy-Two Australian Aboriginals.** [Correspondence.] *Nature.* 1953, Oct. 3, v. 172, 638.

The Veddoids of Southern India have many physical features in common with the Australian aboriginals. Lehmann and Cutbush [this *Bulletin*, 1952, v. 49, 1152] demonstrated a high incidence of the sickle-cell trait in these Veddoids and also showed that their rhesus chromosome distribution was, in many respects, very similar to that found in South-East Asia, Australasia and especially in Australian aboriginals.

The present authors therefore set out to look for the sickle-cell trait in Australian aboriginals. The blood of 72 aboriginals from Queensland (57 of unmixed Australian ancestry) was flown to London in circumstances and under conditions which the authors were satisfied would allow them to demonstrate the sickle-cell trait if it were present. None of these samples showed the sickle-cell trait. The blood group findings confirmed previous records. *H. J. O'D. Burke-Gaffney*

VENOMS AND ANTIVENENES

Hoback, W. W. & Green, T. W. **Treatment of Snake Venom Poisoning with Cortisone and Corticotropin.** *J. Amer. Med. Ass.* 1953, May 16, v. 152, No. 3, 236–7.

Three cases of snake bite in children were treated, within an hour of the biting, with tourniquet application, incision and suction of biting wounds, antivenin, tetanus antitoxin, antibiotics and " other symptomatic and supportive therapy ". In addition, 2 patients received cortisone 25 mgm. every 6 hours, therapy being commenced in one case within an hour and in the other case about 24 hours after being bitten; the third patient was given a single injection of 25 mgm. corticotrophin 45 minutes after the bite.

The authors were impressed with the " decrease in morbidity " exhibited by these patients compared with 11 others seen over the previous 3 years. They consider the cortisone acted by inhibiting local tissue reactivity to foreign protein and by its effects on pain and fever. Relevant literature is briefly discussed. *B. G. Maegraith*

Christensen, P. A. **Problems of Antivenene Standardization revealed by the Flocculation Reaction.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 3, 353–70, 3 figs. [25 refs.]

" Mixed with either of the specific venoms, refined antivenene (anti-*Bitis arietans-Naja flava)* will show optimal flocculation at a number of different venom : serum ratios. This is the natural consequence of individual antigen-antibody reactions in a heterogeneous system.

" Toxin may be recovered from floccules formed at three optimal *N. flava* venom : serum ratios by heating the floccules at 70°C for ten minutes at pH 2. These three immunologically distinct heat-stable toxins have been called the α, β, and γ toxins of *N. flava* venom.

" The flocculation reaction obtained with the viperine venom cannot be interpreted in terms of protective potency.

" Most venom-antivenene systems fail to conform with the ' law of combination in multiple proportions ', *i.e.*, they give non-linear titration curves. The shape of such curves, convex towards the dose axis, is readily explained by the simultaneous titration of multiple toxin-antitoxin systems.

" In the particular case of *N. flava* venom-antivenene, the titration curve obtained with whole venom is determined by the relative anti-α, anti-β, and anti-γ contents of the serum. Further study may pave the way to the standardization of the anti-α, anti-β, and anti-γ potencies of sera, but attempts at standardizing antivenene potency against any venom are futile unless the toxic ' make-up ' of the venom is understood.

" The cross-protection afforded by sera produced against either *N. flava* venom or the venom of *Sepedon haemachates* is limited but indicates an antigenic similarity which may be clarified by work in progress."

Abalos, J. W. El género *Zabius* Thorell, 1894 (Buthidae, Scorpiones). [**The Genus *Zabius* (Buthidae, Scorpions)**] *An. Inst. Med. Regional.* Tucuman, Argentina. 1953, June, v. 3, No. 3, 349–56, 37 figs. (1 on pl.). English summary (4 lines).

Rohayem, H. **Scorpion Toxin and Antagonistic Drugs.** *J. Trop. Med. & Hyg.* 1953, July, v. 56, No. 7, 150–58. [30 refs.]

A summary of the literature on the action and constitution of scorpion venom is given. The author gives some details of his own and other

experimental studies of the physiological action of chemically isolated venom (toxin) in dogs, rats and guineapigs. He concludes that the venom has both somatic and autonomic effects. Certain drugs were tested for antagonistic effects against scorpion toxin. These included ergotamine tartrate (Fermegin: Sandoz), an extract of the alkaloids of belladonna (Bellafoline: Sandoz) and Regetin (Ciba) a new sympathicolytic drug. Antagonism to the toxin was demonstrated by all these compounds, of which Regetin was the most effective.

The paper contains a short account of the treatment of scorpion sting in human beings. Antagonistic drugs have been used with some success but appropriate antivenin should always be given in serious cases. The combination of antagonist and antiserum was possibly sometimes a life-saver. [For previous work on some of these antagonistic drugs, see this *Bulletin*, 1953, v. 50, 555.] *B. G. Maegraith*

Mackinnon, J. E. & Witkind, J. Aracnidismo necrótico. [**Necrotic Arachnidism**] *An. Facul. de Med. Montevideo.* 1953, Mar.–Apr., v. 38, Nos. 3/4, 75–100, 4 figs. [26 refs.] English summary.

In their introductory remarks the authors state that many records exist of spider bites, some of them causing death, the offender very often being the Black Widow, *Latrodectus mactans*; in other cases the spider has not been identified. The present article is a comprehensive account of "a small and apparently inoffensive spider, commonly found in modern as well as old houses in Montevideo and in rustic dwellings" [abstracter's translation]. Volpe and Barberousse (*Arch. Pediat. Uruguay*, 1938, v. 9, 713) published a case ending fatally in a boy of 11 years, 36 hours after he had been bitten. He showed severe cutaneous lesions and signs of intense haemolysis.

The authors first describe 2 cases in which the spider was identified as a female *Loxosceles laeta*. The bitten site was painful, the area of pain extending, and there were swelling and numbness; later the area became reddish violet, bullae formed and later a dry necrotic gangrene. There was considerable systemic disturbance; headache, vomiting, haemoglobinuria, slight jaundice. One patient developed a generalized scarlatinal rash. Other cases, with similar symptoms, are detailed, but in these the spider was not identified. The local symptoms began to improve after about 5 days and the systemic symptoms cleared in 5–7 days. Most cases occur in November-January, 16 out of 29 recorded during the year. The spider has a body about 1 cm. in diameter, is dark yellowish in colour, is not very aggressive, is found in tree-holes and in stone-crevices, but gets into clothes and bites when disturbed, so many of the bites are on the arms. It is found in Chile, in the Argentine, in Brazil, Uruguay, and, according to some authors, in Peru and Guayaquil (Ecuador). The quantity of poison it produces is small, about 0·3 mgm. when dried, but a large specimen may produce double this. All the recorded poisonings have been by females; the male is thought to be non-poisonous.

Experiments showed the venom to be very fatal to mice; of 57 allowed to be bitten on the ear 42 died after a period of excitability, dyspnoea and convulsions; those which survived developed local bullae and necrosis. In rabbits death might occur in 18 hours or less, but if they survived the lesion became necrotic. Guineapigs seemed to be relatively resistant to the venom, but only 3 were subjected to test; 2 lived and presented local

necrosis, the third died but perhaps the death was not due to the poison. The lesions are well shown in photographs. Injection of the venom was made into laboratory animals. In general, it was very potent, causing death in mice and rabbits, or, if they survived, systemic disturbance and local necrosis.

Attempts were made to produce an antivenin in the serum of rabbits, but further study is needed to assess its value. After a series of 6 to 14 bites at 1–2 weeks' intervals a serum was obtained which "protected mice against a minimum fatal dose of the venom" [abstracter's translation]. Other spider antivenins—those against *Lycosa erythrognatha, Phoneutria* sp. and *Latrodectus mactans*—and snake antivenins against *Crotalus* and *Lachesis*—gave no protection. Fortunately, the spider is very sensitive to benzene hexachloride and this should be freely used. *H. Harold Scott*

Maretić, Z. & Jelašić, F. Über den Einfluss des Toxins der Spinne *Latrodectus tredecimguttatus* auf das Nervensystem. [**The Effects of the Toxin of the Spider** *Latrodectus tredecimguttatus* **on the Nervous System**] *Acta Tropica.* Basle. 1953, v. 10, No. 3, 209–24, 9 figs.

This paper contains a very interesting account drawn from a large number of cases of the clinical aspects of *Latrodectus* bite. The local lesion is described very clearly. There is first reddening of the skin in the bitten area; a white urticarial plaque rapidly develops in the centre, surrounded by a well-defined erythematous flare which is often covered with droplets of sweat. The surrounding skin shows a goose-flesh appearance. After a few hours there remains only a sharply defined pale area with a well-marked bluish-red surround. The lesion fades by the second day. There is often considerable local hyperaesthesia in the first few hours; sometimes there is some anaesthesia especially to deep touch, which may remain for days.

In 13 of 18 cases, intradermal injection of histamine into the anaesthetic skin in the region of the bite was followed by the development of a very clearly defined hyperaemic area (ring), quite unlike the wide and intense response evoked in normal skin. This altered histamine response was not observed after the bites of other spiders or stings of wasps. The authors consider it pathognomonic of *Latrodectus* bite.

General reactions include an occasional generalized exanthem appearing within a day of the bite, local enlargement of lymphatic glands, increased sweating and salivation, pains all over the body, especially in the back and abdomen, paraesthesias including burning feeling and formication especially in the soles, rigidity and cramps of the abdominal muscles and sometimes pain in the chest accompanied by dyspnoea. The lower limbs are more affected by pains and cramps than the upper. Tendon reflexes are increased; the abdominal reflexes may be absent especially if rigidity is present. Intense headache is common and there may be psychotic changes. The cerebral nerves are not usually affected; in only one case in about 100 was there dilatation of the pupils. In some cases oedema of the eyelids is a prominent feature.

The authors describe some interesting experiments carried out on their patients, in some cases after they had been bitten deliberately. In one patient in whom a continuous record of cerebrospinal fluid pressure was taken, the appearance of general signs and symptoms corresponded to a rapid rise of fluid pressure (to 450 mm. H_2O) about 2 hours and 10 minutes after the bite.

Details of animal experiments (mostly on cats and rats) are also given, including a pretty demonstration of the passage of trypan blue across the blood-brain barrier after injection of venom.

The authors conclude that the venom of *Latrodectus tredecimguttatus* contains a neurotropic toxin which acts centrally and peripherally. Peripheral nerves play no part in the distribution and spread of the toxin.

B. G. Maegraith

Stanić, M. Beitrag zur Immunologie des Latrodektismus. Über die Herstellung eines entsprechenden Heilserums. [**Observations on the Immunology of *Latrodectus* Poisoning. Preparation of an Immune Serum**] *Acta Tropica*. Basle. 1953, v. 10, No. 3, 225–32.

The author gives a concise summary of the relevant literature and describes experiments which led to the production of an active immune serum in a sheep injected with serially increasing doses of macerated poison glands of *Latrodectus*. This serum was shown to protect mice against a lethal dose of macerated gland. It was used in 2 patients within 3 hours of *Latrodectus* bite. Rapid relief of symptoms was obtained in both after injection of 5 cc. serum intramuscularly and 5 cc. intravenously. Full recovery occurred within 24 hours.

Further trials of the immune serum are planned for the next " season ".

B. G. Maegraith

TOXOPLASMOSIS

Bobo Morillo, T. **Toxoplasmosis.** *Med. Colonial.* Madrid. 1953, Sept. 1, v. 22, No. 3. 275–92. [20 refs.]

A general account and review of the literature, written in Spanish.

Harboe, A. **Toxoplasma Dye Test Titers of 1600 Blood Donors in Oslo.** *Acta Path. et Microb. Scandinavica.* 1952, Suppl. 93 (Trans. 10th Scand. Cong. Path. & Bact., Bergen), 325–30.

The existence of human toxoplasmosis in Norway was first noted in 1950, and later in 1952, but no large-scale observations have hitherto been made on the incidence of this disease.

The author reports the result of a survey devoted to this question, in which the dye test was applied to the sera of 2,000 persons, 1,600 of whom were Oslo blood donors, the remaining being sera received for various other tests, and from healthy persons in other parts of Norway. In applying the test, only preparations showing a minimum of 80 per cent. unstained parasites were regarded as positive.

Among the Oslo blood donors, 7 per cent. had a titre of 1:40 or more, while in 1·6 per cent. it was 1:200 or higher. Comparable results were obtained with sera outside the capital.

C. A. Hoare

Kerkenezov, N. **Congenital Toxoplasmosis: a Case Report.** *Med. J. Australia.* 1953, Aug. 15, v. 2, No. 7, 262.

A case in New South Wales.

Oropeza, P. & Raga Mendoza, M. Toxoplasmosis humana en Venezuela. [**Human Toxoplasmosis in Venezuela**] *Archivos Venezolanos de Puericult. y Pediat.* 1952, Oct.–Dec., v. 15, No. 46, 363–8.

Cole, C. R., Prior, J. A., Docton, F. L., Chamberlain, D. M. & Saslaw, S. **Toxoplasmosis. III. Study of Families exposed to their Toxoplasma-Infected Pet Dogs.** *Arch. Intern. Med.* 1953, Sept., v. 92, No. 3, 308–13. [Refs. in footnotes.]

Toxoplasmosis occurs in the rabbit, gondi, dog, mole, pigeon, mouse, rat, squirrel, monkey, guineapig, wombat, baboon, vole, canary, chimpanzee, sheep, cat, chinchilla and swine. But more evidence is needed to substantiate the belief that animals serve as the reservoir for human infection by the organism in animals which is morphologically, antigenically and pathogenically similar to that which causes the human disease. This paper describes in some detail the results of a survey of 37 persons in families who owned 12 dogs infected with *Toxoplasma*. These 12 dogs were from a group of 28 infected dogs in the Ohio State University Veterinary Clinic, in which the diagnosis had been made by animal transfer of infection to mice, by the cytoplasm-modifying serum test of Sabin and Feldman and by study of biopsy and autopsy tissues. The 37 persons were given physical examinations and Sabin-Feldman and toxoplasmin skin tests were performed. Among these 37 people, 10 persons were sensitive to toxoplasmin, and antibodies to a significant titre (1 in 20 and over) were demonstrated in 7 persons out of 9 in whom the Sabin-Feldman test was positive. In 5 persons the titre was over 1 in 80. No illness was complained of by 35 of the 37 persons but one of the " healthy " individuals, a 26-year-old woman who had nursed her sick dog for 4 weeks, was shown by mouse inoculation to have a parasitaemia [see below].

The 2 sick persons were a 28-year-old woman with toxoplasmic neuroretinitis and encephalitis and a 3-year-old boy with toxoplasmic chorioretinitis and encephalitis.

Demonstration of *Toxoplasma* in the lungs, tonsils, gastric ulcers, intestine, caecum and kidneys of infected dogs suggests that these animals may be potential sources of infection. *M. E. Delafield*

Prior, J. A., Cole, C. R., Docton, F. L., Saslaw, S. & Chamberlain, D. M. **Toxoplasmosis. IV. Report of Three Cases with particular reference to Asymptomatic Toxoplasma Parasitemia in a Young Woman.** *Arch. Intern. Med.* 1953, Sept., v. 92, No. 3, 314–20, 1 fig.

This paper is a more detailed report of the clinical and laboratory data found in the case of toxoplasmic parasitaemia in a " healthy " woman and of the female patient with encephalitis and neuroretinitis which were described in the previous paper by the same authors [see above]. Details of the infected dogs which may have been the causes of these conditions are included. There is added a full account with autopsy findings of a fatal case of toxoplasmosis complicated by severe concurrent whooping cough in a 2-year-old girl. Numerous intracellular *Toxoplasma* organisms were found in the myocardium and pseudocysts were seen within and around areas of necrosis and inflammation in the brain.

[For previous work in this series, see this *Bulletin*, 1953, v. 50, 652.] *M. E. Delafield*

Bleier, W., Kabelitz, H. J. & Siegert, A. Statistische Untersuchungen über die Konformität bzw. Diskrepanz der drei wichtigsten Toxoplasmoseteste. [**Statistical Study of the Agreement or Disagreement between the Three Most Important Tests for Toxoplasmosis**] *Ärztl. Forschung.* 1953, July 10, v. 7, No. 7, I/320–25. [20 refs.]

The authors, in Erlangen, Bavaria, studied the correlation between the dye-, skin- and complement-fixation- tests for toxoplasmosis in a large number of medical and gynaecological patients. The statistical methods used were those of rank correlation. They found good agreement between the dye- and complement-fixation tests, but no special correlation between the skin test and either of these. In gynaecological patients, there was no correlation at all between the skin test and the other two, and in medical patients, the correlation was relatively slight. *H. J. O'D. Burke-Gaffney*

Møller, T. **Toxoplasmosis Vulpis Vulpis (Fox Toxoplasmosis).** *Acta Path. et Microb. Scandinavica.* 1952, Suppl. 93 (Trans. 10th Scand. Cong. Path. & Bact., Bergen), 308–20, 10 figs. [12 refs.]

In this paper is recorded for the first time the occurrence, in Denmark, of toxoplasmosis in the silver fox [variety of *Vulpes fulva*]. In 2 cases the diagnosis was established by the finding of the parasites on autopsy. The infection in these animals was generalized, the liver being the organ chiefly affected. Both animals died, but the only clinical symptoms were loss of appetite, as well as difficulty in breathing and mucous discharge from the nose and eyes in one of them. However, in a third fox the infection was symptomless, the diagnosis having been established by positive reaction to the dye test, with titres starting at 1 : 1,250 and falling to 1 : 250 after 4 months of observation, when the animal was killed. The dye test performed on 22 more foxes from the same farm was negative or with low titres (up to 1 : 10) in 8 animals, and with higher titres (1 : 50 to 1 : 1,250) in the remaining ones. The paper is illustrated by photomicrographs of tissue sections showing the histopathological changes and pseudocysts.

C. A. Hoare

Manwell, R. D., Bernstein, E. & Dillon, R. *Toxoplasma* **in Frogs.** *J. Parasitology.* 1953, Aug., v. 39, No. 4, Sect. 1, 406–7.

Fifty-two frogs (*Rana pipiens*) were inoculated with the RH strain of *Toxoplasma gondii*, by the following routes:—brain, mouth, muscle and peritoneum. Peritoneal fluid and homogenates of viscera were tested for the presence of the organisms after various intervals from 6 hours to 7 days, by inoculation (and 2 subinoculations) into white mice. The results were essentially negative, the organisms remaining alive for only a few hours, with a maximum of 72 hours in a single case in the brain after intracerebral inoculation. Incubation of *Toxoplasma* with frog's blood at 3°C. for 24 hours did not kill the organisms, because subsequent inoculation of this mixture into mice produced typical infections. *P. C. C. Garnham*

Kass, E. **Experimental Toxoplasmosis.** *Acta Path. et Microb. Scandinavica.* 1952, Suppl. 93 (Trans. 10th Scand. Cong. Path. & Bact., Bergen), 321–4. [11 refs.]

The author records various observations on rabbits experimentally infected with *Toxoplasma* from the peritoneal exudate of mice through which a human strain (RH) has been passaged for some years.

It was found that the most characteristic sign in infected rabbits was rhinitis. This could be produced by inoculating the animals not only into the nasal cavity, but also after oral, conjunctival and intraperitoneal inoculations. In addition to rhinitis, some of the rabbits developed conjunctivitis or pneumonia. Material obtained from the nose, throat and eyes of infected rabbits was infective to mice, but their urine was not. However, mice could be infected with the urine of rabbits inoculated into the urinary bladder.

The effect of inoculation by the oral route was tried by feeding rabbits through stomach tubes with gelatin capsules containing a suspension of the parasites. When the capsules reached the stomach in intact condition, no infection was produced, but when they ruptured, releasing the contents in the mouth, the results were positive. In the latter case no parasites could be detected in the faeces.

By intraperitoneal inoculation of a pregnant rabbit, congenital infection was produced in its offspring. This was demonstrated by successful infection of mice with material from the rabbit placenta and from the young. Young rabbits born from mothers with chronic toxoplasmosis reacted positively to the dye and complement-fixation tests during the first weeks after birth. *C. A. Hoare*

DERMATOLOGY AND FUNGUS DISEASES

Clarke, G. H. V. **Common Dermatological Entities in West Africa.** *East African Med. J.* 1953, Aug., v. 30, No. 8, 333–7, 6 figs.

Of the various dermatoses seen in West Africa, some are relatively familiar to dermatologists, others are of completely unknown aetiology.

(1) *Fixed eruptions.* These are of variable size and are raised and dusky purple when fresh, but tend to be blacker when older. They are probably due to proprietary pills containing phenolphthalein, which are taken "in vast amounts".

(2) *Lichen planus verrucosus.* This is the usual type of lichen planus in West Africa, and is extremely resistant to treatment. Mapharside appears to be of some value and small areas may be excised or cauterized.

(3) *Keratosis pilaris group.* Some of these are examples of phrynoderma and respond to vitamin A. Others fail to respond to vitamins A or B. Of these latter cases some exhibit the Kobner phenomenon, others resemble pityriasis rubra pilaris with conical follicular plugs on the dorsum of the phalanges and tylosis but no erythema or scaling on the body.

(4) *The velvet leg syndrome.* This is a diffuse hyperpigmented hyperkeratosis of shins and calves. The surface feels rough and is deep black in colour. There is invariable pruritus but no ulceration or secondary infection. There has been no microscopical confirmation of the suggestion that *Onchocerca volvulus* is the cause of the condition.

(5) *Pustular dermatitis of the legs.* A symmetrical pruritic eruption consisting of pustules of various sizes on the front of the legs. Only *Staphylococcus aureus* is obtained on culture of the lesions, the serum tests are negative, there is no eosinophilia and no fungus is found on microscopical examination. It has been suggested that the pustules are due to penetration of the epidermis by the points of grass through which the patient walks, but this is stated to be disproved by the fact that occlusion makes the condition worse. Aureomycin improves but fails to cure it.

(6) *Dermatitis of the dorsa of both feet.* Similar appearances may occur

in pellagra, leprosy and fungus infections, but this appears to be a separate entity remarkable for its symmetry, long history and rebelliousness to treatment.

(7) An affection of children consisting of vesicles and pustules resembling dermatitis herpetiformis and leaving depigmented scars on healing.

Both Kaposi's sarcoma and lichen planus occur fairly frequently.

H. T. H. Wilson

Gelfand, M. **Diffuse Scleroderma in an African Male.** *J. Trop. Med. & Hyg.* 1953, Sept., v. 56, No. 9, 199–200, 2 figs.

Both scleroderma and lupus erythematosus may occur in the Bantu, but their frequency is not accurately known. It is extremely important, but not necessarily easy, to be able to distinguish these 2 conditions from leprosy.

The case described is that of an African male aged 32 who first complained of weakness, swelling of the face and pains in the forearms. He lost weight and was inclined to vomit after meals. The fingers became contracted with ulcers on some of them. On the right hand the fingers were flexed and the skin was atrophic, shiny and tight. There was no thickening of the ulnar nerve and sensation was normal. The skin of the face was tense, giving a masklike expressionless appearance and interfering with movement.

On the anterior chest wall were small circular hypopigmented patches 1–1·5 cm. in diameter. The nervous system was normal and reflexes were unaltered although the forearms could not be fully extended at the elbow joints. No abnormality was found in the heart and lungs and a barium series showed a normal intestinal tract.

The clinical diagnosis was confirmed by a skin biopsy which showed homogenization and fibrosis of the collagen fibres and thinning of the corium with atrophy of the dermal appendages. *H. T. H. Wilson*

Nuñez Andrade, R. Dermatozoonosis mas frecuentes observadas en México y su tratamiento. [**Common Dermatozoonoses in Mexico and their Treatment**] *Medicina.* Mexico. 1953, Aug. 10, v. 33, No. 681, 353–63. [27 refs.]

Most of the information in this article is well known to readers of the *Tropical Diseases Bulletin*. The author mentions 10 groups of skin affections caused mainly by insects and seen by him during the past 23 years. He mentions those infecting animals as well as those attacking man, any diseases they transmit, treatment of the lesions they cause and measures for their suppression. To give one example, of fleas he mentions *Pulex irritans*, *Ctenocephalides canis* and *C. felis*, *Hoplopsyllus*, *Juxtapulex* and *Xenopsylla*, some attacking dogs, squirrels and rats, the local lesions they produce, the transmission of bubonic plague by the last-named, prophylaxis by DDT, Gammexane, sodium fluoro-acetate [" 1080 "] and other insecticides, and the local treatment by antipruritic lotions; similarly, bugs, pediculi, scabies of man and itch in dog, cat, ass, mule, horse and pig; next, mosquitoes, ticks, flies (myiasis from *Calliphora vomitoria*, *Cordylobia anthropophaga*, *Hypoderma bovis* and other species), acariasis including parasites of barley and other grains, pine and copra dermatitis, and several others, the condition known also as Nuñez Andrade's disease, a dermatitis due to *Neoschoengastia nuñezi*, haematosiphoniasis due to bites by *Haematosiphon inodora* and commonly called *coruco* or " fowl bug " (*chinche de los pollos*) in Mexico. Larva migrans and cutaneous cysticercosis,

trichinellosis and bathers' dermatitis from schistosome cercariae are also listed.

H. Harold Scott

Canizares, O. & Shatin, H. **Arthropods of Dermatological Interest.** *Arch. Dermat & Syph.* 1953, Aug., v. 68, No. 2, 157–66.

This is simply a classified and annotated list of arthropods which are of importance to the dermatologist. They fall into 4 classes, Crustacea, Chilopoda, Arachnida and Hexapoda (Insecta) and the list is arranged under those heads. Essential morphological features are briefly indicated as are the dermatoses produced and the diseases transmitted. The scientific names are given for about 60 species but the common names are also shown both for the organisms and the diseases.

[This is one of those lists that the student likes to have by him for quick reference.]

H. S. Leeson

Martin, M. La coccidioidomycose existe-t-elle au Congo Belge? [**Does Coccidioidomycosis exist in the Belgian Congo?**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 237–40. [10 refs.]

The possible existence of silent endemic foci or coccidioidal infection in parts of the Old World has been suggested from time to time, but no proof has been offered and, indeed, the matter has received but little attention from the investigator. Dr. Martin's survey by means of the coccidioidin skin test, in the Belgian Congo, is therefore particularly welcome.

The coccidioidin test was performed on 1,701 persons in Léopoldville; in 932 of the tests coccidioidin was used at a dilution of 1 : 1,000 and in 769 at 1 : 100. The former group yielded 29 positive results (3·1 per cent.) and the latter also 29 (3·7 per cent.). In each of these groups of reactors to coccidioidin, all but one person were also sensitive to tuberculin. Of the 58 reactions to coccidioidin, 55 were classified as +, being 5 mm. or more in diameter but less than 10 mm., and 3 as + +, being more than 10 and less than 16 mm. in diameter.

The coccidioidin-sensitive subjects included 55 adult males, 1 adult female and 2 children. The Lower Congo furnished 23 of the reactors, the Upper Congo 11, Angola 23 and Kasai 1. Radiological examinations of the chest on 34 of the reactors showed chronic lesions, chiefly fibrotic or calcified nodules in the lungs, in 25.

[The significance of reactions to the coccidioidin skin test in the Belgian Congo cannot be assessed on the evidence presented. Histoplasmosis has been shown by Dubois *et al.* (*Bulletin of Hygiene*, 1953, v. 28, 628) to exist in the country, and persons dominantly sensitive to histoplasmin frequently show cross sensitivity to coccidioidin, although not usually when it is used at a dilution of 1 : 1,000 [see Smith *et al.*, this *Bulletin*, 1949, v. 46, 1172]. Simultaneous tests with histoplasmin might, however, shed some light on the reactions to the coccidioidin test in the Belgian Congo.]

J. T. Duncan

Castro, A. & Trejos, A. Primer caso centroamericano de coccidioidomicosis. [**First Central American Case of Coccidioidomycosis**] *Rev. Biologia Trop.* San José, Costa Rica. 1953, July, v. 1, No. 1, 83–93, 15 figs. on 3 pls. [15 refs.]

The English summary appended to the paper is as follows:—

"1. The first case of coccidioidomycosis in Central America, a patient from Honduras who had been living for the last 24 years in the Comayagua Valley, is described.

"2. The diagnosis was confirmed by mycological examinations, and additional studies with respect to the morphology of *C. immitis* during its parasitic phase, were made.

"3. The Valley of Comayagua, Honduras, is discussed as a new endemic area for coccidioidomycosis."

Trejos, A. & Romero, A. Contribución al estudio de las blastomicosis en Costa Rica. [**Contribution to the Study of the Blastomycoses in Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1953, July, v. 1, No. 1, 63–81, 40 figs. on 6 pls. [13 refs.] English summary.

Lutz's disease (South American or Brazilian blastomycosis), hitherto regarded as a disease peculiar to South America, has been identified in Costa Rica, and the case described by the authors is the third to be diagnosed in that country.

An agriculturist, aged 61, from the eastern part of Costa Rica, suffered from nodular, ulcerating lesions, resembling yaws, on the face and the sole of the foot, an abscess in the submaxillary region and a vegetating, epithelioma-like growth on the gum of the lower jaw in the incisor area. The lymph nodes of the axillary group were enlarged, and exhausting diarrhoea was a distressing feature.

The diagnosis of Lutz's disease was based on the histology of the skin lesions and the cultivation of the causative fungus (*Paracoccidioides brasiliensis*) from them.

Despite treatment with sulphonamides and streptomycin, the man died. A complete autopsy was not possible, but a piece of intestine removed showed numerous ulcers, 3 of which were perforated. A preparation from the lesion on the gum showed, in addition to the characteristic form of the parasite with "peripheral" budding, a spherule containing apparent endospores, like the mature sporangium of *Coccidioides immitis*, which, the authors consider, may represent an additional mode of reproduction.

A description is also given of a case of Lobo's disease or keloid blastomycosis, which is not only the first to be identified in Costa Rica, but, apparently, also the first to be found outside the Amazon basin. In this case, the disease, which was of 30 years' duration, affected the left leg of an agriculturist, aged 60, from the south-eastern part of the country. The initial lesion appeared as a little flattened nodule on the external malleolus which, after many years of dormancy, commenced to extend laterally. Secondary nodules developed in the neighbourhood and, by coalescence, formed a raised, nodular plaque which encircled the leg at the ankle. Other nodules developed in a chain along the line of the tibial crest, another group on the lower, lateral aspect of the knee joint, and a chain of smaller nodules on the mesial aspect of the leg. The skin covering the older lesions was stretched and atrophic, discoloured and deprived of hair. On the whole, the nodules were painless and firm but not indurated. It was evident that extension took place through the superficial lymphatic channels, but for many years there was no indication of involvement of the lymph nodes; eventually a crural node was found affected and enlarged to the size of a pigeon's egg.

An initial diagnosis of blastomycosis was based on the histological study of the lesions, and the more precise diagnosis of Lobo's disease was made later and was confirmed at the Instituto Oswaldo Cruz, Brazil. Although the fungus (*Glenosporella loboi*, Fonseca & Leão, 1940) was abundant in the lesions, all attempts to cultivate it, extending over a period of a year, were unsuccessful.

[Artagaveytia-Allende and Montemayor (this *Bulletin*, 1950, v. 47, 493) considered *Glenosporella loboi* to be, in fact, *Paracoccidioides brasiliensis*, and Lobo's disease merely a dermal form of Lutz's disease. See also da Fonseca (*ibid.*, 1947, v. 44, 610), and de Almeida and Lacaz (*ibid.*, 1950, v. 47, 778).] *J. T. Duncan*

TROPICAL OPHTHALMOLOGY

Amies, C. R., Loewenthal, L. J. A., Murray, N. L. & Scott, J. G. **Blindness in the Bantu. A Survey of External Eye Disease and Malnutrition in the North Eastern Transvaal.** *South African Med. J.* 1953, July 18, v. 27, No. 29, 593–7, 8 figs. [12 refs.]

This survey was carried out in the North Eastern Transvaal on 259 patients of the Bavenda and 253 of the Shangaan tribes. It showed that in the Bantu much blindness resulted from corneal lesions for which there were 2 main causes. The first of these was trachoma and the second was leucoma. Trachoma led to corneal scarring from keratitis, often aggravated by trichiasis and entropion, and the principal cause of leucoma was bacterial conjunctivitis which progressed to ulceration and perforation because the correct treatment was not available. The 7-fold difference in the incidence of trachoma between the 2 tribes was attributed to the good hygiene and better washing facilities of the Bavenda. It also proved that malnutrition played no part whatever in rendering the ocular tissues susceptible to infection as both tribes had similar nutrition. The authors also formed the conclusion that malnutrition was the direct cause of few, if any, of the leucomata found in either survey.

Trachoma alone was responsible for a blindness rate of 781 per 100,000. On a previous survey a blindness rate of 1,190 per 100,000 was found for leucoma alone. The blindness rate for Europeans in South Africa was 91 per 100,000 (all causes).

The authors point out that the examination of stained films for inclusion bodies requires considerable experience and should not be undertaken lightly. Poleff's stain for trachoma inclusion bodies gave unsatisfactory results: the basophile mast cells were clearly defined but the true Halberstaedter-Prowazek bodies remained unstained. *E. W. O'G. Kirwan*

Naccache, R. **Topical Use of Terramycin Ointment in Trachoma.** *Brit. J. Ophthalm.* 1953, Feb., v. 37, No. 2, 106–8, 2 figs.

The results are recorded of 36 cases of trachoma treated by the author in Lebanon for a period of 3 months by local application with 0·5 per cent. terramycin [oxytetracycline] ointment.

Of these, 6 cases of trachoma I were cured; 7 of early trachoma II were cured and 15 were greatly improved; and 8 of trachoma III were moderately improved. It was found that terramycin was a very valuable drug for the treatment of trachoma and secondary infection. It is quicker in its action than the sulphonamides and the absence of toxicity permits longer treatment, especially in the cases of children, pregnant women and debilitated patients. *E. W. O'G. Kirwan*

HEAT STROKE AND ALLIED CONDITIONS

Burch, G. E., Ray, C. T. & Threefoot, S. A. **Some Theoretic Considerations of Electrolyte Space measured by the Tracer Method in Intact Man.** *J. Lab. & Clin. Med.* 1953, July, v. 42, No. 1, 34–57, 10 figs.

The authors examine the theoretical possibilities arising from the interplay of many factors conditioning fluid and electrolyte shifts from various body compartments separated by membranes of variable permeability. They stress the difficulties inherent in determination of the volume of these compartments in health and disease even when the accurate tracer technique is used.

[The reader of average mathematical ability should follow this necessarily somewhat complicated discussion.] *M. L. Thomson*

Threefoot, S. A., Burch, G. E. & Ray, C. T. **Chloride " Space " and Total Exchanging Chloride in Man measured with Long-Life Radiochloride, Cl^{36}.** *J. Lab. & Clin. Med.* 1953, July, v. 42, No. 1, 16–33, 6 figs. [14 refs.]

Measurement by the isotope dilution method with Cl^{36} showed that mean daily chloride space in 2 normal subjects was 34·8 and 22·5 per cent. of body weight as against 36·1, 65·6 and 60·8 per cent. in 3 cases of congestive cardiac failure. The mean calculated chloride mass was 59·0 and 40·4 gm. in the normal and 85·2, 147·0 and 88·7 gm. in the diseased subjects.

Isolated determinations of chloride space may be misleading because of wide daily fluctuations, particularly in subjects with congestive failure. Calculated values may also differ from actual values because of the instability of chloride metabolism, its alteration in specific diseases, *e.g.*, tuberculosis, and the entry of chloride into cells, bone and other sequestrated compartments. These considerations apply to at least as great an extent to non-isotopic methods for determining chloride and extracellular spaces.

M. L. Thomson

Dole, V. P. & Thaysen, J. H. **Variation in the Functional Power of Human Sweat Glands.** *J. Exper. Med.* 1953, Aug. 1, v. 98, No. 2, 129–44, 6 text figs. & 3 figs. on pl. [13 refs.]

The starch-iodine technique of Minor (*Deutsch. Z. Nervenheilk*, 1927, v. 101, 302), which had been modified by Randall (*J. Clin. Invest.*, 1946, v. 25, 761), has here been further improved by the incorporation of iodine as well as starch into the print paper. It was ascertained that the method could be quantitative, the amount of sweat being proportional to the area of dots over a wide range of sweating rates. Sweating was provoked thermally or by injecting mecholyl intradermally.

In this way it was found that, unlike the palmar glands which are known to intermit, the general eccrine sweat glands discharged in a steady manner. The relative activity of glands in a given area remained constant in spite of changing output. The density of glands and their functional power varied over 4 body areas but the dispersion of relative activity about the means was similar. When sweat flow was declining the relative activity of the glands remained constant, showing that the set of glands varied together as a functional unit. *M. L. Thomson*

Berenson, G. S. & Burch, G. E. **A Study of the Sodium, Potassium, and Chloride Contents of Thermal Sweat of Man collected from Small Isolated Areas of Skin.** *J. Lab. & Clin. Med.* 1953, July, v. 42, No. 1, 58–77, 10 figs. [25 refs.]

The authors studied the Na, K and Cl content of sweat by aspiration at intervals from lucite cups attached to the skin of 31 subjects sweating at ambient temperature 104°F. (40°C.) and 95 per cent. relative humidity.

The concentration of Na and Cl increased as sweating progressed but was always hypotonic; that of K decreased but was always hypertonic to serum. Three women subjects secreted on the average less than half as much sweat as males. Of 5 areas studied the highest concentration of Na and Cl occurred in the forehead and axilla; rates of sweating and concentrations were, however, similar in corresponding positions on right and left forearms.

Ischaemia reduced sweating and increased K content. A low sodium chloride diet reduced sweat concentration of Na and Cl; a change to a low Na and high Cl diet produced a corresponding change in these ions in sweat.

During the New Orleans summer, rates of sweating were higher, and K concentrations lower than in winter.

The authors emphasize the high individual variability in all measurements. *M. L. Thomson*

MISCELLANEOUS DISEASES

West Indian Med. J. 1953, June, v. 2, No. 2, 93–124, 14 figs. (9 on 3 pls.). **The Vomiting Sickness of Jamaica.** [Symposium at the University College of the West Indies, March 27th, 1953 (Fitzmaurice, L. W., Chairman).]

This symposium comprises statements on various aspects of the syndrome which for half a century or more has gone by the vague name of the Vomiting Sickness of Jamaica. Remarks were made on the clinical, pathological, botanical, chemical, pharmacological, biochemical and bacteriological aspects. Among all this almost the only fresh point elicited was that by Professor Hill and his fellow-pathologists on the mode of action of the poison by bringing about glycogen depletion. With the exception of the pathogenesis mentioned, nearly all the points brought forward and the questions asked were discussed and answered in the monograph published 37 years ago in 1916.

Drs. Jelliffe and Stuart reported cases to show the clinical side.

Professor Hill and Dr. Bras recorded the morbid anatomy and pathological histology. Professor Asprey and Mrs. Thornton described the ackee (*Blighia sapida*) and brought evidence that the arillus of the *ripe* fruit is non-toxic, with which all will agree, but that the seed contains toxins (see later). [Since the seed is hard as a stone and not even West Indian teeth could easily crack it, much less masticate it, this fact is irrelevant; the immature arillus is the source of the poison.] Professor Hassall and Dr. Reyle are studying this and promise early report of their findings. Drs. Grant and Caselitz told of their bacteriological investigations and, as would be expected, recorded negative results.

Dr. Cicely Williams, who has been in charge of the investigation,

summed up the year's work. She refers to amoebiasis and worms, particularly ascariasis, but the symptoms of these infections have nothing in common with " vomiting sickness ". She divagates into child welfare and malnutrition in Jamaica and their associations with " vomiting sickness ", possibly harking back to her studies of kwashiorkor in West Africa; but ackee poisoning affects adults as well as children and the well-nourished quite as often as the ill-nourished. All her other points will be found discussed in the 1916 monograph and subsequent reports. There will be general agreement with her when she says that the term " Vomiting Sickness " should be dropped and, as she puts it, " we must stop saying ' Is this a case of Vomiting Sickness?' and we must ask instead ' What is the cause of vomiting in this case? ' "

One other point the reviewer would like to refer to. Dr. Moody asked " whether, in the post-mortems of animals that have been killed by the poisonous substances isolated from the ackee, the appearances are those of fatty infiltration of the liver?" and Dr. Feng in reply said " In the impressions given to me by the pathologists there is no significant histological change."

This is, of course, quite the opposite of what Professor Hill and the pathologists have stated (in relation to human liver) in this symposium and recorded elsewhere and also what is stated in the 1916 monograph, and the following is worth recording in this connexion. In 1917 the reviewer gave an address and demonstration at the Society of Tropical Medicine and Hygiene (it was not Royal then), Sir David Bruce being in the chair. There were shown stained sections of the liver and other tissues of (a) a case of so-called Vomiting Sickness; (b) a case of known ackee poisoning, and (c) an experimental kitten killed by ingestion of ackee soup, " pot-water ", the label in each case being covered up. Sir David's remark on examining these was " We haven't time to waste in looking at 3 specimens showing the same lesions ". The fatty changes were identical and he was much surprised to hear that they were not all three from the same body.

Finally, to quote a clinching case: Scott performed a post-mortem (in Porus) on a typical case of vomiting sickness so reported and concluded that death was due to ackee poisoning. This man's daughter, Malina Simpson by name, a great, healthy, strapping girl, scoffed at the idea, tore off an ackee from the same fallen branch and before she could be stopped ate the fruit. Her symptoms came on in 3–4 hours and Scott carried out a post-mortem on her the following day. Sections of her tissues are at the London School of Hygiene and Tropical Medicine now.

To sum up briefly: in Jamaica, as in all parts of the world, children die after an illness in which vomiting may be a prominent symptom, but in Jamaica there is a syndrome with a characteristic train of symptoms—early gastric, effortful vomiting, followed by a calm interval of return to apparently normal health; so a doctor is not called in. This is the interval of absorption of the poison. In another 4 hours or so vomiting returns, but now is effortless, pumping, cerebral, soon followed by convulsions, coma and death, usually in 12–24 hours after the toxic food has been taken. This syndrome is characteristic and, consequently, so general and indefinite a term as vomiting sickness should be discarded, the cause of the vomiting be looked for and the diagnosis Food Poisoning, Ackee, made in those cases which present the characteristic sequence of events, especially if the fruit is found in the vomit, or in the stomach, and easily accessible. Research workers should aim at isolating a water-soluble poison present in arilli of unopened ackee.]

H. Harold Scott

de Lajudie, P., Fournier, J. & Chambon, L. L'appareil flagellaire du bacille de Whitmore. [**The Flagellar Apparatus of Whitmore's Bacillus**] *Ann. Inst. Pasteur.* 1953, July, v. 85, No. 1, 112–16, 1 fig. [15 refs.]

The authors demonstrated the flagella of Whitmore's bacillus most successfully by Casarès-Gil's method; the paper contains a number of very clear photographs. They found that the organism has 1 to 4 flagella arising from the poles. Young bacilli are monotrichous, older ones lophotrichous. The flagella are at one pole only until division is about to occur, when they may be seen at both poles.

These observations confirm those of Brindle and Cowan [*Bull. Hyg.*, 1952, v. 27, 491], and the authors agree with these workers that Whitmore's bacillus should be placed, with the glanders bacillus, in the *Pseudomonadaceae*. They appear, however, to favour the generic name *Malleomyces* rather than the proposed name *Loefflerella*. *J. C. Cruickshank*

Brygoo, E. R. & Henry, E. Action *in vitro* de divers antibiotiques sur le bacille de Whitmore. [**The Action *in vitro* of Various Antibiotics on Whitmore's Bacillus**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 279–83.

The action of various drugs and antibiotics was tested on 40 strains of *Pf. whitmori* from 24 cases in Saigon. The tests were made in tubes of peptone water which received a heavy inoculum and were examined after incubation for 24 hours at 37°C. followed by a week at room temperature (25–30°C.). The following substances had little or no inhibitory action in practicable concentrations: sulphadiazine, sulphamethyl-pyrimidine, PAS, 1,500 F succinyl DDS, penicillin, streptomycin, bacitracin. Terramycin [oxytetracycline] and neomycin had some effect (but in later work, now in the press, the senior author has found neomycin ineffective *in vivo*). Aureomycin was bacteriostatic in concentrations of about 0·05 mgm./ml. (extremes, 0·03–0·125 mgm./ml.) and bactericidal at 0·88 mgm./ml. (extremes, 0·25–2·0 mgm./ml.) [but see also Cruickshank, this *Bulletin*, 1949, v. 46, 1085]. The most active substance was chloramphenicol with a mean bacteriostatic concentration of 0·07 mgm./ml. (extremes, 0·015–0·25 mgm./ml.) and a mean bactericidal concentration of 0·3 mgm. (extremes. 0·125–0·5 mgm./ml). [For the action of chloramphenicol in *Pf. whitmori* infection of guineapigs, see this *Bulletin*, 1953, v. 50, 853.]

BAL (2,3 dimercaptopropanol) enhanced the low bacteriostatic activity of streptomycin, but not that of the other antibiotics. No significant synergic effect was obtained with mixtures of the antibiotics. *J. C. Cruickshank*

Brygoo, E. R. Contribution à l'étude des agglutinines naturelles pour le bacille de Whitmore. Les agglutinines spécifiques dans quelques cas de mélioïdose. [**A Contribution to the Study of Natural Agglutinins to Whitmore's Bacillus. Specific Agglutinins in a Number of Cases of Melioidosis**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 347–53.

Agglutinins to Whitmore's bacillus were studied with suspensions prepared from a number of different strains, but all gave similar results. Natural agglutinins were determined in 465 sera submitted for routine examination in Saigon. In those from non-febrile persons ("Wassermann sera") no titres over 1/20 were observed. Agglutinins were more frequent in sera submitted from patients suspected of enteric or typhus fever, some of

whom were presumably febrile. Of these, 4·2 per cent. showed titres to *Pf. whitmori* of 1/40 or over, and 2·7 per cent. of 1/80 or over. Of the 465 sera, about 2 per cent. had titres of 1/80 or over. There were no differences related to sex, but Asians had agglutinins more often than Europeans.

Details are given of the agglutinins observed in 8 cases of melioidosis. The titres usually ranged from 1/80 to 1/640, but sometimes they appeared late in the illness, and they were absent in one case of several weeks' duration, a patient with an occipital abscess from which the organism was isolated.

The general conclusion is that a presumptive diagnosis of melioidosis can be safely made in the majority of suspected cases showing a titre to *Pf. whitmori* of 1/80 or over. *J. C. Cruickshank*

DE LAJUDIE, P. & BRYGOO, E. R. Contribution à l'étude du pouvoir pathogène du bacille de Whitmore. (Premier mémoire.) [**A Contribution to the Study of the Pathogenicity of Whitmore's Bacillus**] *Ann. Inst. Pasteur.* 1953, July, v. 85, No. 1, 99–106. [15 refs.]

The isolation of 43 strains of *Pfeifferella whitmori* from 25 patients with melioidosis provided an opportunity to survey the pathogenicity of the organism. The natural infection in man ranged from a rapidly fatal septicaemia to a solitary abscess healing spontaneously; pulmonary manifestations were most frequent. Though the natural disease is known to occur in epizootic form in rodents, and has occasionally been found, usually in the form of pulmonary abscesses, in dogs, cats, cows and horses examined post mortem, the author, in common with a number of previous observers, failed to find evidence of infection in extensive surveys of laboratory animals, wild rats or porcine mesenteric glands.

The literature relating to experimental pathogenicity is reviewed and the results of the authors' own observations in numerous animal species are described. Frogs, fish and birds (fowls and pigeons) were resistant to subcutaneous or intramuscular injection of *Pf. whitmori*, though an occasional animal died after the inoculation of a very large dosage. Mice usually succumbed from the third day onwards after subcutaneous injection of large dosages (100,000 to 5 million organisms), but some mice survived for several weeks. It is concluded that mice are relatively resistant as compared with guineapigs, which with similar dosages were mostly dead in 7 days and all dead within 14 days. Guineapigs could be infected by almost any route including application to the mucous membranes, but application to the scarified skin (recommended for isolation from contaminated material such as sputum) sometimes failed. The lesions produced by experimental infection are described; they are the same as those observed by previous workers.

A strain kept in laboratory culture appeared to have retained full virulence [but the authors' observations on the relative virulence of this and other strains give no precise information as they were not made with graded doses but by recording survival times after the injection of one large dose]. *J. C. Cruickshank*

PARASITOLOGY: GENERAL

Ritchie, L. S., Hunter, G. W., Pan, C., Yokogawa, M., Nagano, K. & Szewczak, J. T., with the technical assistance of S. Asakura, Y. Hishinuma & M. Shimizu. **Parasitological Studies in the Far East. VIII. An Epidemiologic Survey of the Tone River Area, Japan.** *Japanese J. Med. Sci. & Biol.* 1953, Feb., v. 6, No. 1, 33–43. [14 refs.]

"In a series of communities adjacent to the Tone and Edo rivers, Japan, 90·7% of 2525 individuals harbored intestinal parasites; 88·0% had helminths and 31·8% protozoa. Commonly encountered parasites occurred as follows: *A. lumbricoides* 64·9%, *T. trichiura* 27·3%, hookworm 48·4%, *Trichostrongylus* sp. 20·3%, *E. vermicularis* (by scotch tape) 54·5%, *S. japonicum* 4·1%, *C. sinensis* 6·7%, *E. histolytica* 4·1%, *E. coli* 20·5% and *E. nana* 13·5%. An incidence of 77·7% for *Trichostrongylus* sp. occurred in one village. *S. japonicum* did not exceed 15% in any one community. The highest incidence of *E. histolytica* was 8·7%. Severe *Ascaris* infections probably did not exceed 10% of the total infected, while heavy infections of whipworm and hookworm were quite uncommon."

Hunter, G. W., Ritchie, L. S., Pan, C., Yokogawa, M. & Altamirano, with the technical assistance of J. Heller, M. Shimizu, Y. Hishinuma & S. Asakura. **Parasitological Studies in the Far East. IX. An Epidemiologic Survey of Shikoku Island, Japan.** *Japanese J. Med. Sci. & Biol.* 1953, Feb., v. 6, No. 1, 45–55. [12 refs.]

"An epidemiologic survey of intestinal and blood parasites was made on Shikoku Island, Japan, including prefectural areas of Kagawa, Tokushima, Kochi and Ehime. Intestinal parasites occurred in 94·8% of 1729 persons; 93·3% harbored helminths and 36·1% protozoa.

"Occurrence of specific helminths were *A. lumbricoides* 79·5%, *T. trichiura* 65·9%, *hookworm* 36·6%, *Trichostrongylus* sp. 3·8% and *E. vermicularis* (by scotch tape swab) 68·5%. The intensity of both ascaris and whipworm infections in Shikoku were relatively high as compared with other areas of Japan; hookworm infections were consistently light.

"The incidence of specific protozoa was as follows: *E. histolytica* 6·8%, *E. coli* 24·7%, *E. nana* 15·4%, *I. bütschlii* 1·4%, *G. lamblia* 3·7% and *C. mesnili* 1·1%. For the 16 communities surveyed *E. histolytica* ranged from 0·9% to 12·8%.

"No autochthonous cases of *Schistosoma japonicum* or of the snail host were encountered. *Metagonimus yokogawai* occurred with greater frequency than *C. sinensis* with an incidence of 7·2% for the survey and a figure of approximately 20% in two communities. *Paragonimus westermani* occurred with an incidence of 3·2% in the routine survey of Ehime (13 individuals). Special studies in the same area yielded a grand total of 25 positives out of 83 examined. None of 367 persons examined for malaria in Kochi prefecture was infected and only one of 369 examined for filariasis was infected."

Goldman, M. & Brooke, M. M. **Protozoans in Stools unpreserved and preserved in PVA-Fixative.** *Pub. Health Rep.* Wash. 1953, July, v. 68, No. 7, 703–6.

The authors have already shown the efficacy of polyvinyl alcohol [PVA] fixative in preserving amoebic trophozoites (*J. Lab. and Clin. Med.*, 1949, v. 34, 1554) and they now compare this technique with other methods for detecting protozoa in faeces.

Five hundred specimens were examined in Atlanta from 270 patients newly admitted to hospital and persons suspected of having intestinal parasites. Unpreserved portions of stools were examined by direct smears, by zinc sulphate concentration and by haematoxylin staining. Specimens preserved by PVA were examined by haematoxylin staining only. The techniques used are described and the results shown in 3 tables.

The " PVA-haematoxylin " specimens showed more positives (146) than any one of the techniques used on unpreserved specimens [92, in the case of the next most efficient technique]. In addition, 7 infections by *Dientamoeba fragilis* were found by the PVA-haematoxylin method, and these were missed by all the other techniques.

The greater efficacy of the PVA method is especially due to its ability to preserve trophozoites (124 out of 124 detected): the most efficient of the other methods revealed only 17 out of 124. Furthermore, of 200 infections found by all 4 techniques, 126 (63 per cent.) contained trophozoites with or without cysts, while 72 (36 per cent.) contained trophozoites only. Evidently a method which makes the detection of trophozoites possible will increase considerably the number of positives found. It is of interest that trophozoites were found in 59 per cent. of formed stools.

The PVA method was less efficient in the detection of cysts than any one of the methods used on unpreserved specimens. The PVA method did, however, reveal more infections than all the techniques on unpreserved methods put together. As might be expected, all 4 techniques secured more positives than the combination of any 2. However, it is suggested that in practice the PVA technique together with the zinc sulphate method [to detect cysts] would appear to be the best combination, since with these 2 methods 95 per cent. of the infections detected by all 4 techniques were revealed. It is noted that 8 per cent. of organisms were not identified, even when all 4 techniques were used. *H. J. O'D. Burke-Gaffney*

Alekseev, N. G. [**Rare Localization of** *Entamoeba gingivalis* **and** *Trichomonas elongata*] *Med. Parasit. & Parasitic Dis.* Moscow. 1953, No. 3, 273–6, 5 figs. [In Russian.]

The author reports the finding of *Entamoeba gingivalis* and *Trichomonas elongata* [=*T. tenax*] in the maxillary sinus of a patient suffering from chronic suppurative polypous sinusitis on the right side. Examination of the matter removed from the sinus by puncture revealed numerous neutrophile leucocytes in different stages of degeneration, many erythrocytes, some epithelial cells, and a varied flora, in which spindle-shaped bacilli and spirochaetes were predominant. In addition, the pus contained the above-named protozoa, which were identified in stained preparations. In these it could be seen that the amoebae had ingested complete leucocytes, while some of them contained oxyphilic inclusions which might have been erythrocytes, for these were present in considerable numbers in the material examined.

The cause of sinusitis in the patient was traced to diseased teeth. The inflammatory process led to the formation of a fistula, which established communication between the oral cavity and the antrum, thus enabling the amoebae and flagellates present in the former to penetrate into the latter.

C. A. Hoare

See also p. 123, Bucki *et al.*, **Technic for differentiating and preserving Protozoa in Feces.**

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

See also p. 109, Canizares & Shatin, **Arthropods of Dermatological Interest.**

See also p. 4, Roubaud, Fluctuations spontanées dans la dispersion des culicides, observées dans la Vendée côtière depuis l'occupation allemande. Interprétation du problème. [**Spontaneous Fluctuations in the Distribution of Mosquitoes Observed in the Coastal Region of Vendée during the German Occupation**]

Van Der Kuyp. **Mosquitoes of Curaçao.** *Caribbean Med. J.* 1953, v. 15, Nos. 1/2, 37–9, 1 map on pl.

A locality list and a map are given showing the distribution of 11 species of mosquitoes collected on the Island of Curaçao between the years 1941 and 1947.

Only one anopheline was taken—*Anopheles punctipennis punctipennis.* The most common domestic mosquitoes were *Aëdes aegypti* and *Culex quinquefasciatus* [*C. fatigans*]. *H. S. Leeson*

Hu, S. M. K. **Mosquito Survey of Guam.** *Mosquito News.* 1953, June, v. 13, No. 2, 123–5.

Two mosquito-borne diseases have been found on Guam, namely Japanese B encephalitis and dengue (which has caused very large epidemics). Of the mosquitoes which exist there, *Aëdes albopictus* is abundant and is a potential vector of Japanese B encephalitis, dengue and yellow fever; *Anopheles subpictus indefinitus* is stated to have been incriminated as a vector of malaria in Celebes and is therefore a potential vector on Guam, where there are now large numbers of labourers imported from endemic areas of malaria; *Culex quinquefasciatus* [*C. fatigans*] is common and is a potential vector of Japanese B encephalitis. Various other mosquitoes are named in this short paper. *Charles Wilcocks*

Beckel, W. E. **Prelminary Observations on a Hatching Stimulus for *Aedes* eggs (Culicidae).** *Science.* 1953, Sept. 4, v. 118, 279–80.

It is known that, at Churchill, Manitoba, Canada, the eggs of *Aëdes campestris* hatch in the field later than those of *Aëdes hexodontus* and it has been observed that while the latter hatch at just over 0°C., the former will do so only at higher temperatures. It seems, however, that temperature is only a limiting factor in the action of a hatching stimulus due to decaying organic matter. To examine this question the author reports certain observations.

Eggs of the 2 species were stored in different ways for varying periods at different temperatures. They were then placed in distilled water or in an infusion of decaying mosquito bodies. From the results (which are given

in a table) the author believes that there is some factor in such an infusion which stimulates the hatching of the eggs at the appropriate temperatures. Further experiments are proceeding on similar lines. *H. S. Leeson*

Audy, J. R. **Trombiculid Mites and Scrub Itch.** Reprinted from *Australian J. of Sci.* 1951, Dec., v. 14, No. 3, 94–5.

Of the 14 species of Trombiculid mites known to attack man freely, 12 cause an intense specific reaction, trombidiasis, which is referred to as scrub-itch, ti-tree or duck-shooter's itch, grass-itch and so on. Six of these species are known from Australia or Asia, one from Europe, Britain and probably Egypt, and the remaining 5 from North and South America. The author points out that the natural hosts of more than half of these species are birds and reptiles, man being attacked only accidentally. As long association between a host and its parasite tends to make the mutual relationship less harmful, it might be supposed that the scrub-itch mites are essentially reptile and bird parasites, causing an intense reaction when feeding on an unnatural mammalian host like man; *Trombicula akamushi* and *Trombicula deliensis* which bite man without causing any violent reaction, have never been recorded as being parasitic on reptiles. It is pointed out, however, that at least 4 species of scrub-itch mites [among them *Trombicula autumnalis*] appear to favour mammalian hosts, chief among them being the rabbit. It could be that the immunity shown by these animals is an acquired one, being developed through long association. *Trombicula autumnalis* is quite commonly found on birds (heavy natural infestations of blackbirds have been recorded from Denmark) and the author suggests that birds might indeed be the primary hosts of this species. In the case of the other three species (from Australia), a wider collection of reptiles from the particular infested areas and exposure of reptiles and birds as baits might produce interesting results. *M. G. R. Varma*

World Health Organization: Expert Committee on Insecticides. **Insecticides. Manual of Specifications for Insecticides and for Spraying and Dusting Apparatus.** [Loose-leaf collection of specifications.] 1953. Geneva: W.H.O., Palais des Nations. (Sales agent for U.K., H.M. Stationery Office.) [60s.; $8.50; Sw.fr. 35.–.]

The contents of this publication have practically all appeared before in the 4 reports of the WHO Expert Committee on Insecticides [see this *Bulletin*, 1953, v. 50, 577]. However, in this loose-leaf booklet, the various specifications are somewhat re-arranged in order to be in a consistent logical order. The various items are arranged under 2 main headings: *Insecticides* and *Apparatus*. The first gives specifications for: (1) technical grade products (DDT, BHC, methoxychlor, chlordane, dieldrin and pyrethrum extract); (2) water-dispersible powders (DDT and BHC); and (3) emulsion concentrates (DDT, BHC and dieldrin).

The section on apparatus starts with nomenclature and definitions and then gives specifications for (i) sprayers (hand and hydraulic type), (ii) dusters (hand, plunger type and rotary), and (iii) spare parts. The various critical tests are described in reasonable detail and illustrated by figures.

A feature of this publication is that additions and amendments up to at least the end of 1955 will be sent out free to purchasers of this volume.

J. R. Busvine

Rajindar Pal, McCauley, R. H., Jr. & Fay, R. W. **The Relationship between the Physical Forms of D.D.T. and their Biological Effectiveness on Water Surfaces.** *Indian J. Malariology.* 1952, Sept., v. 6, No. 3, 225–38, 3 charts & 3 figs. on 2 pls.

Biological and chemical tests, mainly in the laboratory, were conducted to investigate the rather rapid decline in effectiveness (after application) of mosquito larvicides containing DDT. The biological tests were done with a shallow tray of water divided by a barrier. The larvicides were applied one side of this barrier and the mosquito larvae (*A. quadrimaculatus*) were introduced and removed underneath the barrier, from the other side. Thus they could be given short exposures to the larvicides (35 minutes) and returned to clean water for 24 hours before mortality counts were made. The results showed that DDT in fairly volatile solvents, such as cyclohexanone, gave a high kill which declined gradually in tests up to 17 days. When DDT was dissolved in less volatile solvents, such as fuel oil or methylated naphthalenes, the effectiveness was low at first, but rose to a peak in 2 to 4 days, after which it rapidly declined. These differences are correlated with crystallization of the DDT which occurs soon, with numerous fine crystals, from cyclohexanone. With the other solvents, the crystallization does not occur for a day or two and the crystals soon afterwards grow larger and sink.

Chemical tests showed that DDT applied as thin films of solutions in various solvents on water, gradually disappeared, about 30 to 40 per cent. being lost in 4 weeks. If the water was allowed to evaporate to dryness in 3 weeks, much more DDT was lost (61 to 86 per cent. of 9 mgm. applied).

Biological tests showed that DDT, dissolved in fuel oil and stored in clear glass bottles for 2 weeks, lost much of its activity if kept in the sun.

Other laboratory tests with films on water subjected to artificial wind and rain showed how the effectiveness of the larvicide could be curtailed by the weather. *J. R. Busvine*

Rajindar Pal. **The Relationship between the Physical Forms of D.D.T. and their Biological Effectiveness on Solid Surfaces.** *Indian J. Malariology.* 1952, Sept., v. 6, No. 3, 239–50, 6 figs. on 3 pls.

Glass panels were sprayed with solutions and emulsions of DDT and subsequently observed for the rate and type of crystallization. At intervals, panels were selected for tests of insecticidal activity, which were made by confining house-flies on them for 15-minute exposures or until knock-down occurred. The following types of crystal occurred: I. dendritic, II. needle-like, III. spherulitic, IV. needles and prisms mixed, V. fragments of crystals.

The insecticidal efficiency was found to be high while the plates were still wet but to decline as the solvent evaporated. Weighing tests showed that over 90 per cent. of a xylene solution would evaporate without crystallization, thus leaving supersaturated droplets. When these were mechanically stimulated, they crystallized immediately and the resulting fine crystals were more insecticidal (as shown by Parkin and Green, *Nature*, 1945, v. 155, 668). The author attributes the decline in effectiveness of the drying solution to decrease in its wetting power and illustrates this by measurements of the contact angles of DDT-kerosene solutions with house-fly tarsi. The advancing contact angle was below 11° on the first day, 12° on the second day, 23° on the third, 90° on the fourth and approximately 180° (semi-solid) on the fifth.

The effectiveness of several types of crystal habit was judged by the average time for 50 per cent. knock-down of house-flies exposed to residues of 100 mgm. per sq. ft. on glass panels. Initially, the times for 5 different preparations were all about 20 minutes; but after daily exposures for 2 weeks differences began to appear. Type I (from xylene emulsion) was most persistent, followed by III and IV (from benzene), then V from xylene (present in a dust) and finally II (from kerosene). This order of efficiency is only relevant to impervious flat surfaces like glass. *J. R. Busvine*

Fay, R. W., Kilpatrick, J. W., Crowell, R. L. & Quarterman, K. D. **A Method for Field Detection of Adult-Mosquito Resistance to DDT Residues.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 3, 345–51, 1 fig.

The method consists of exposing batches of mosquitoes in a paper cylinder treated with DDT for a standard time and then making mortality counts after 24 hours in a clean cage. The paper is treated by dipping in a xylene solution of technical DDT (or extract from a wettable powder), draining and then drying for 24–72 hours before use. Papers (5·25 × 8 inches) are rolled up to form cylinders 5·25 inches long and 1·25 inches in diameter which are secured by small metal-gauze end caps.

The mosquitoes are inserted by aspirator and, after exposure, gently blown into a clean paper cylinder, supplied with syrup. The exact base-line data must be worked out by each operator; the authors, using female *A. quadrimaculatus*, found that an exposure of 45 minutes, to paper treated with a 1 per cent. DDT solution, gave suitable kills. Mortalities were increased by higher temperatures and were slightly higher in mosquitoes of mixed ages than in 3-day-old mosquitoes. Usually about 20 mosquitoes were used in each batch.

[The method is very similar to one described by the abstracter [see this *Bulletin*, 1953, v. 50, 1176] which is equally simple and more reliable than the one described here, which has the following disadvantages: (i) If technical DDT is used (or extracts from wettable powders) the insecticide may vary, from time to time, with different supplies and results obtained in different parts of the world would certainly not be comparable. This could be avoided by using a sample of pure *pp'*-DDT. (ii) Crystallization on paper from volatile solvents gives irregular deposits, variable from one occasion to the next. Mortality is not closely related to rate of deposit. Both these inaccuracies can be remedied by using insecticide residues dissolved in a non-volatile oil. (iii) No mention is made of the condition of the mosquitoes in regard to feeding. A blood meal is known to make them much more resistant.] *J. R. Busvine*

Tattersfield, F., Kerridge, Jill R. & Taylor, Jean. **The Effect of Repeated Spraying of Insects in increasing their Resistance to Insecticides. I. Development of Resistance to DDT in a Strain of *Drosophila melanogaster* Meig.** *Ann. Applied Biol.* 1953, Sept., v. 40, No. 3, 498–522, 1 plan & 8 figs. [24 refs.]

Tattersfield, F. & Kerridge, Jill R. **The Effect of Repeated Spraying of Insects in increasing their Resistance to Insecticides. II. The Effect of Carbon-Dioxide Sensitivity on the Toxicity of DDT within a Strain of *Drosophila melanogaster*.** *Ann. Applied Biol.* 1953, Sept., v. 40, No. 3, 523–36, 4 figs.

LABORATORY PROCEDURES

Bucki, A. J., Wells, W. H. & Vail, J. R. **Technic for differentiating and preserving Protozoa in Feces.** *U.S. Armed Forces Med. J.* 1953, Aug., v. 4, No. 8, 1195–9, 5 figs.

Intestinal protozoa in faeces were fixed and stained in the following solution: 2 grammes of brilliant cresyl blue are thoroughly dissolved in 75 cc. of methanol, then are added 5 cc. formalin, 2·5 cc. glacial acetic acid, 2·5 cc. liquid phenol and 15 cc. distilled water. A small piece of faeces is well mixed with a large drop of this solution on a slide, and the preparation is examined wet under a cover slip. Trophozoites are fixed with the pseudopodia extruded and ingested red blood cells stain black. Nuclei are distinct with the blue-black chromatin well differentiated. Chromatoid bodies stain dark blue and glycogen remains unstained. The penetration of the reagent into cysts is extremely rapid. Flagellates and amoebae may both be diagnosed by this method which is said to give pictures as satisfactory as those produced by iron haematoxylin. Specimens may be preserved for at least 9 months by thoroughly mixing 1 part of faeces with 5 parts of reagent and keeping in a tightly stoppered container.

P. C. C. Garnham

MISCELLANEOUS PAPERS

Chesterman, C. C. **The Training and Employment of Auxiliary Personnel in Medical and Health Services in Tropical Africa.** *J. Trop. Med. & Hyg.* 1953, June, v. 56, No. 6, 123–33.

This important study by one who has worked many years in the tropics is most opportune and should be studied by all associated with the training of medical staff in Africa. The author not only records the different kinds of medical auxiliaries, but also criticizes wisely and fairly and puts forward some valuable suggestions. The reader will find much that will interest him in the report and will be provided with an excellent conception of the various training facilities available in Africa.

What impresses one particularly in the report are the many variations in grades of African medical personnel. No doubt much of this depends on the degree of European influence and control in the area. For instance, where the European doctor is well established, there one will find the emphasis on the training of medical assistants, but where the political structure is more advanced and more is entrusted to the African, something higher than the medical assistant will be encountered. Here one will find medical schools attempting to train what Chesterman refers to as the " near doctor " (or the nearly qualified medical officer) or even a fully qualified medical officer. Much, too, depends on the resources of a territory, the influence of the missionary bodies and the educational facilities provided for the African.

Chesterman reports that greater emphasis is laid on the curative aspect of medicine. This he considers correct and thinks it is better " to work from the known to the unknown ". There is also much preventive medicine practised in the curative branches, since by treating diseases like yaws, syphilis, sleeping sickness, leprosy and malaria, the source of infection is reduced. Also the key man in an epidemic is often the one who has a

knowledge of diagnosis and is able to administer the appropriate chemotherapeutic agent in correct amount. Chesterman stresses the important point that the preventive services should not be divorced from those of the curative, but rather they should be complementary to each other and operating from the same centre which he prefers to call the Health Centre. Here he suggests should be placed a centre combining curative, maternity, and welfare work with hygiene and social medicine. The various grades of auxiliary workers will operate as a team under a senior medical assistant or clinic superintendent.

He considers the subject from two aspects:—

(a) The Curative Services.

(b) The Preventive Services.

(a) The following categories of personnel are included in the *Curative Services.*

1. The " Near Doctor ", " The Doctor " or " African Medical Officer ".
2. Medical Assistants.
3. Medical Aids.
4. Personnel recruited for specialized work, *e.g.*, vaccination, sleeping sickness, malaria.

1. *The Near Doctor*

There are still hundreds of " near doctors " practising in tropical Africa. From the Dakar School of Medicine alone, no less than 600 have qualified (médicins). Today however their training and studies will be completed at Bordeaux and Marseilles.

The " near doctor " is an African trained in a medical school, the qualification being just short of, or inferior to, the recognized European medical degree or diploma. The training of this man has been in existence for some years in French West Africa, Nigeria, Sudan and Uganda. But the end of the " near doctor " is in sight and for practical purposes the different colleges have ceased training him. But he has served his purpose well, although he has never really been content with his lot. He has resented his subordinate position and has not submitted readily to supervision or direction. Also he has been unwilling to remain for any length of time in rural areas. Being a subordinate he has been tempted to shirk responsibility. So today we find these different territories have established medical schools from which medical officers with a proper recognized qualification will emerge.

The Yaba School at Lagos has not been fortunate and is now replaced by the Medical Faculty of the University College of Ibadan. The Medical Training Faculty at Kampala, Uganda, has recently been upgraded. It will be training students for British degrees registrable by the General Medical Council of the United Kingdom, who will be called African Medical Officers instead of the former Assistant Medical Officers who were limited in their sphere of activity. So far over 120 Sudanese have qualified from the Kitchener School of Medicine, Khartoum, and since 1945 graduates have been eligible to sit for the qualifying examination and postgraduate diplomas of the Conjoint Board of the Royal Colleges.

2. *Medical Assistants*

Next to the doctor or " near doctor " comes the *medical assistant*—who with a modest general education is given 2 to 3 years' training to fit him to run a rural dispensary. He is indispensable for any under-doctored country and there is a widespread demand for him. Many however doubt his value and trustworthiness. Almost every territory trains him except the Gold

Coast, which prides itself on having qualified doctors or nothing, although it does now envisage a grade of "Clinic Superintendent" to supervise the activities of some 40 Health Centres.

It is comparatively easy to teach an African youth with a modest education a good deal of factual information about anatomy and physiology and to teach him to apply standard treatments. It is, however, much harder to impart to him a Hippocratic tradition of honesty and consideration for his patients. Many indulge in illicit private practice and stories of abuse abound. But it is accepted that on the whole the medical assistant renders valuable service and is indispensable.

The following territories provide training schools for the medical assistant:—

Belgian Congo. There the training of *Medical Assistants* and *Infirmiers* is carried on most successfully and elaborately.

Three grades exist:—

(a) *Medical Assistant.* (4 years' training plus 2 years' *stage* [*i.e.*, practice under supervision].) This grade approximates to that of the "near doctor." He receives his training at Léopoldville and Astrida.

(b) *Infermier.* (3 years' plus 2 years' *stage*.) These medical assistants are trained at 8 official schools and centres, Roman Catholic and Protestant mission stations.

(c) *Aide-Infirmier.* (6 to 12 months.)

Sudan, Uganda and Tanganyika. Similar training for medical assistants is given, as in the Congo *Infirmiers* (grade b).

N. Rhodesia (Lusaka) and Nyasaland (Zomba) have schools for this grade. Here he is called a Hospital Assistant.

Kenya. Here the name Hospital Assistant is given to the product of a school, which much more resembles a Nurses' Training School controlled by the Kenya Nursing Council.

S. Rhodesia. The Medical Assistant is referred to as a Native Nursing Orderly and corresponds somewhat to the Kenya graduate.

French Equatorial Africa and West Africa cater for the *Assistant Sanitaire* who does not receive such a systematic training as is attempted elsewhere, nor do elaborate rural dispensaries figure so largely in the medical organization. The policy is rather to use the outpost for the detection of epidemics or recognition of serious cases which are to be evacuated to the nearest hospital.

In *Nigeria* nothing comparable to the medical assistant has been evolved. Up to the present the nearest approach to him is the *Dispensary Assistant* who receives a year's instruction at Zaria or Kano (in the North) and at Makundi (in the South).

Dr. Chesterman advocates the following general points in order to ensure a satisfactory type of medical assistant.

1. The training school to be attached to a medium-sized hospital. 2. Proper text-books to be provided. 3. A students' hostel is essential. 4. Adequate supervision by a medical man. 5. Provision of refresher courses. 6. Satisfactory pay and status.

3. *Medical Aids*

This title includes auxiliary workers in the curative services who have received a simple and short training. In Uganda, Kenya and N. Rhodesia they are known as *Dressers*, as *Untrained Orderlies* in S. Rhodesia, *Dispensary Assistants* in Nigeria and as *Medical Aids* in Nyasaland. Rural

medical aid in Tanganyika (where they are given a 2-year course) and as *Aide Infirmier* (about ½- to 1-year course) in the Congo.

It is not wise, Dr. Chesterman mentions, to train these men in the same schools as medical assistants, since they are apt to become dissatisfied. Also included in this group are the personnel recruited for special work, *e.g.*, vaccination, sleeping sickness and malaria.

Sanitary or Preventive Services

As with the curative services, the titles given for the same duties vary considerably.

The highest grade attained is that of the *Health Inspector*—in Kenya he is known as such, in Uganda and Tanganyika as an *Assistant Health Inspector*, in Nyasaland and N. Rhodesia as *Sanitary Assistant*, but S. Rhodesia prefers the title *Native Health Demonstrator*. In the Belgian Congo he is called *Garde Sanitaire*. As a rule the African Health Inspector does a 3-year course. Next comes the *Hygiene Health Assistant* who completes 2 years of study, and lowest of all is the *Hygiene Aid* who is the "one-job man", reserved for special duties, like mosquito boys, rat catchers, and those employed on venereal disease, sleeping sickness, leprosy or schistosomiasis.

The Hygiene Inspector and Hygiene Assistant usually train in Schools of Hygiene under a Health Inspector and a Medical Officer. Recruiting for this type of work is more difficult. There is little chance, it would seem, of indulging in a lucrative private practice. Also in the curative services there is close individual relationship with the patient, and this makes a greater appeal.

The Special Services (Laboratory, Pharmaceutical and Dental Services)
Laboratory Services

There is growing demand for reliable technicians in the laboratories, both central and rural. They are styled: *Laboratory Assistant* in East Africa, *Laboratory Attendant* in the Gold Coast and *Laboratory Technical Assistant* in Nigeria.

In S. Rhodesia, Nyasaland, French and Belgian territories, the tendency is to take trained *infirmiers* or medical assistants and give them a specialized supplementary laboratory course. In the Gold Coast and elsewhere the Laboratory Assistants undergo a special course of training lasting for as long as 3 or 4 years.

Pharmaceutical Services

It is only in the more advanced territories like the Gold Coast that Africans can qualify as pharmacists and set up in business. The semi-trained pharmacist or dispenser is not the right person to be placed in charge of a rural dispensary and governments have usually endeavoured to centralize the preparation and distribution of drugs and to keep them under well-qualified supervision.

In some territories, as in the Sudan and Uganda, in view of the considerable number of rural hospitals and dispensaries, the governments are training many such persons called *Dispensers*. In Kenya they are styled *Compounders* and in Tanganyika *Pharmaceutical Assistants*. In French West Africa they are drawn for special instruction in pharmacy from ranks of *Infirmiers Brevetés*. The Pharmaceutical Aids are generally little more than "bottle-washers".

Dental Services, etc.

Little is being done as regards the training of dental or physiotherapy assistants. Special dental auxiliaries are being trained in Nigeria. Even less is being undertaken in physiotherapy, but a few places (Kenya, Sudan and Nigeria) have started to train Radiographic Assistants.

Dr. Chesterman draws the following conclusions and recommendations:—

1. There is a great need for auxiliary workers in Africa.
2. Africans are keen in all matters relating to health.
3. Auxiliaries must work under some authority, *e.g.*, government, commercial or mission, and they should not be allowed to operate in private.
4. Whenever possible, "bridges or points of entry" to the high grades should be made from the lower ranks, so that outstanding talent or good character can be rewarded.
5. The apprenticeship system is valuable.
6. Practice and theory should be combined.
7. The mission can provide an atmosphere in which ideals of service and high ethical standards can be fostered.
8. *Esprit de corps* should be encouraged by uniforms, simple publications, refresher courses, prizes, etc. *M. Gelfand*

Bull. Calcutta School Trop. Med. 1953, July, v. 1, No. 1, 1–46 mimeographed pp.

The first issue of the *Bulletin of the Calcutta School of Tropical Medicine* is a small and modest publication in mimeograph form. It contains brief reports on researches being carried out; these notes are very short, and presumably many of the authors whose names appear will report their work more fully in the established journals. No doubt these short accounts will be valuable locally, to give a concise impression of the current work of the School. The *Bulletin* will be published 4 times in the year.

Valuable journals sometimes grow from small beginnings; this may, one hopes, do so. *Charles Wilcocks*

World Health Organization. **World Directory of Medical Schools.** 220 pp. [In English and French.] 1953. Geneva: W.H.O., Palais des Nations. (Sales agent for U.K., H.M. Stationery Office.) [25s.; $4.00; Sw.fr.15.–.] [This review appears also in the *Bulletin of Hygiene.*]

This comprehensive directory, the first of its kind, lists over 500 medical schools and gives such data as year of foundation, conditions of admission, numbers of teachers and students, cost and length of courses and qualifications awarded. The information is clearly set out in tabular form, arranged alphabetically by countries, according to their English names. The compilers draw attention to gaps in the tables, notably in those for China and Eastern European countries, and to the fact that some of their information may by now be out of date. A case in point is condition of entry to various schools in England and Wales, which is stated to be Matriculation, an examination replaced since 1951 by the General Certificate of Education. *John Rathborn*

BOOK REVIEW

MOZLEY, Alan [D.Sc., Ph.D., F.R.S.E.]. **A Background for the Prevention of Bilharzia.** pp. viii + 71, 11 figs. 1953. London: H. K. Lewis & Co. Ltd., 136, Gower Street, W.C.1. [9s.]

The title of this monograph is misleading. The short title is "The Prevention of Bilharzia," but only the human disease is discussed and infection with *Schistosoma japonicum* is barely referred to because the author has confined himself to species and geographical areas (Africa and the Middle East) of which he has first-hand knowledge. Moreover, although one might expect concrete information about methods of prevention, there is a complete absence of detail, and the main purpose of the book appears to be an appeal for an ecological approach to the problem and for the employment of naturalistic control measures which are mentioned in broad terms but without any accompanying evidence that they may be effective.

There are six chapters, the titles of which give little indication of their content, followed by two appendices, the first recommending further reading on the subject and the second being a glossary of technical terms. Subjects dealt with include the life histories and geographical distributions of the parasites and their vectors, and the difficulty of identification of molluscan hosts. The main interest is in the snails, the factors affecting their occurrence, the types of surface water, natural or artificial, in which they may be found, and the plants and animals living in association with them.

Methods of control are discussed in general terms and it is recommended that harmless snail species should be introduced into the habitat of vector species, which by consuming the food of the latter will limit their numbers. [No evidence is offered, however, that both groups have the same food requirements.] With reference to molluscicides it is stated that the use of general poisons which kill all living organisms [presumably in the water] is undesirable as a rule. Copper sulphate is regarded as the most satisfactory and convenient compound, and the more recently introduced molluscicides are barely mentioned and not by name.

[It is difficult to see for whom this book is intended. It contains many contradictions, important omissions and a striking absence of detailed information on the subjects discussed. Control measures are not discussed systematically but are interpolated into every chapter. Those who have some knowledge of schistosomiasis will be irritated by the vague and discursive treatment of the subject, while those wishing to learn about the disease and its prevention will not find the facts and recommendations they might reasonably expect.] *T. H. Davey*

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